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Final Environmental Impact Statement

Lakewood Southeast Project

Lakewood-Laona Ranger District, Chequamegon-Nicolet National Forest, Oconto County, Wisconsin

T30N, R16E, Section 1; T30N, R17E, Sections 1, 4-6; T30N, R18E, Sections 5, 6; T31N, R16E, Sections 1, 12-14, 23-27, 33-36; T31N, R.17E, Sections 1-36; T31N, R18E, Sections 6, 7, 18, 19, 30 31; T32, R17E, Sections 1-5, 8-17, 20-36; T32N, R18E, Sections 6, 7, 18, 19, 30, 31; T33N, R17E, Sections 33-36; T33N, R18E, Section 31; 4th PM

LAKEWOOD SOUTHEAST PROJECT
Final Environmental Impact Statement
Oconto County, Wisconsin

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Abstract: This Final Environmental Impact Statement (FEIS) for the Lakewood Southeast (project) Project proposes to manage vegetation and habitat on approximately 36,939 acres of national forest. This project would occur on the Lakewood-Laona Ranger District (District), and would include vegetation, wildlife habitat, ecosystem, and access management.

Public involvement was used in the development of this FEIS. Public comments helped refine the scope of the decision, identify key issues, shape alternatives, and direct the analysis of effects. The IDT (interdisciplinary team) identified key issues in this analysis related to how actions would affect vegetation, wildlife, and landscape pattern. They analyzed four alternatives in detail:

- Alternative 1, the No Action Alternative
- Alternative 2, Proposed Action, was sent to the public for initial scoping. This is the agency preferred alternative.
- Alternative 3, Early Successional Habitat Alternative
- Alternative 4, Late Successional Habitat Alternative

SUMMARY

Introduction
The Lakewood Southeast Project Area (project area) is located in the southeastern portion of the Lakewood-Laona Ranger District. This project contains approximately 36,939 acres of National Forest lands. While the project area contains some non-Forest Service lands, the Forest Service actions do not pertain to them. This project is in accordance with management activities consistent with the Chequamegon-Nicolet National Forest 2004 Land and Resource Management Plan (forest plan). This document discloses the direct, indirect, and cumulative impacts that would result from the proposed action and alternatives.

Project location
The Lakewood Southeast (LSE) analysis area is located in the southeastern portion of the Lakewood-Laona Ranger District southeast of Mountain, Wisconsin. The legal description of

the area includes lands lying within the National Forest boundary within: T30N, R16E, Section 1; T30N, R.17E, Sections 1, 4-6; T30N, R18E, Section 5, 6; T31N, R16E, Sections 1, 12-14, 23-27, 33-36; T31N, R.17E, Sections 1-36; T31N, R18E, Sections 6, 7, 18, 19, 30 31; T32, R17E, Sections 1-5, 8-17, 20-36; T32N, R18E, Sections 6, 7, 18, 19, 30, 31; T33N, R17E, Sections 33-36; T33N, R18E, Section 31.

Purpose and need

- Correct composition by management area (MA) A) 4B B) 2C and 4A
- Correct age class distribution- A) aspen, B) paper birch, C) northern hardwoods, D) jack pine, E) red pine, F) white pine, G) balsam fir, H) northern red oak.
- Improve cold water fisheries
- Increase tree species diversity
- Decrease stocking- uneven-aged hardwood, mixed hardwood, red pine, and white pine
- Communities of concern- A) Northern Dry Forests, B) Pine Barrens
- Wildlife Habitat Improvement- A) maintain wildlife openings, B) improve hawk nesting habitat, C) protect and enhance wood turtle habitats
- Reduce hazardous fuels
- Access Management

Public Involvement

The CNNF notified or consulted with local tribes, concerned agencies, local governments, and the public about this project during the early stages of project development. Opportunities to provide comments regarding this proposed project was through consultation letters, scoping packages, a Notice of Intent in the Federal Register, the CNNF quarterly Schedule of Proposed Actions, and the CNNF's web page.

The draft EIS was sent out to self-subscribers and commenters from the scoping on October 11, 2012. It was published in the Federal Register on October 19, 2012. Comments received were reviewed and considered by the interdisciplinary team (IDT). We received comments from 70 interested parties as a result of these efforts.

Issues

The IDT received public and internal comments expressing concerns regarding the Proposed Action. The Deciding Official identified the following key issues from the scoping. All these issues are external. There are no internal key issues:

A. Aspen Management

A1. The key issue is the loss of early successional forest/young aspen.

The proposed action would cause a net decrease in the early successional habitat/young aspen. The project's proposed clearcutting of 815 acres is beneficial to early successional species, but the conversion of over twice that amount of aspen (1,796 acres) to other forest types would cause a decrease in early successional habitat/young aspen.

A2. The key issue is a loss of mature aspen, which is habitat for forest raptors.

The proposed action, which clearcuts 736 acres of older aspen, would create young forest. Increasing early successional habitat could reduce nesting habitat opportunities for goshawks that may nest in mature aspen stands.

B. Road Management

B1. Road construction/reconstruction effects road density

The proposed action would construct 2.1, reconstruct 32.8, close 3.9, and decommission 26.5 miles of roads. Road density within the project area exceeds the forest plan guidelines; the proposed action would reduce road density.

B2. Road construction/reconstruction can have pervasive and cumulative effects on resources

Road construction and reconstruction can have pervasive and cumulative effects that increase sedimentation in waterways and the spread invasive species.

Alternatives

No Action Alternative – Alternative 1

No new activities would take place or no effects to current actions. Other than normal ongoing administrative, maintenance, and protection work, no actions would take place within the project area. In the short-term (see specials reports for time frames), the project area would remain similar to the current condition. Aspen composition would not be expected to change in the short-term.

Proposed Action Alternative – Alternative 2

The Proposed Action Alternative is the alternative originally proposed by the agency. The IDT created this alternative to best respond to the purpose and need, meeting the desired conditions in the forest plan. The Forest Service developed Alternative 2 to move the area toward desired conditions from the current conditions. This alternative addresses the early successional/aspen issue by converting existing aspen in MA 4B to other forest cover types. Some of the aspen reduction would occur in the 450' buffers on the selected class I trout streams and the 300' buffer on the non-selected class I and class II trout streams. This alternative reduces overall road density (Issue B), due to closures and decommissioning of roads.

Early Successional Habitat Alternative – Alternative 3- Agency Preferred Alternative

IDT developed this alternative to address the key issue of early successional habitat/aspen loss, while still meeting the purpose and need. This alternative would increase early successional habitat by increasing clearcuts and decreasing thinning compared to Alternative 2. Clearcutting old aspen would provide more acres of young aspen. Reduced mileage of road construction and reconstruction would address the road issue better than Alternative 2. The change in vegetation management under this alternative would reduce the amount of road construction and reconstruction. Road density would also decrease (see chart at the end of chapter 2).

Late Successional Habitat Alternative – Alternative 4

The IDT developed this alternative to address both key issues of reduction in mature aspen habitat and road construction and reconstruction. This alternative decreases aspen treatment and allows natural succession to occur. This alternative contains less clear cuts and thinning to

address this issue (including the early successional dependent wildlife species), than Alternative 2.

This alternative eliminates road reconstruction, which would eliminate any impacts caused by reconstruction. Alternative 4 reduces road construction compared with Alternative 2. Road density would not increase.

A short comparison summary of each alternative is provided in the table below. Table 1 displays vegetation, prescribed fire, and transportation management activities that would occur under the four action alternatives.

Table 1 – Actions and issues by alternative

Major activities	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Total acres harvested	0	11,707	10,751	6,486
Acres selection harvest	0	194	194	64
Acres thinning	0	5,592	4,249	4,354
*Acres clear cut	0	1,246	2,021	374
Acres of shelterwood	0	4,282	3,894	1,422
Acres special cut	0	393	393	272
*Acres of aspen change, short-term	0	-900	-78	-139
Acres of aspen change, long-term	-1,400	-1,800	-786	-1,772
Acres of stand improvement	0	903	850	519
Acres under plant	0	2,045	1,768	948
Acres of full plant	0	510	598	339
Acres under story burn	0	2,527	2,733	2,039
*Miles of road construction	0	2.1	1.2	1.8
*Miles existing road reconstructed	0	32.8	30.7	0
*Decommissioned open unauthorized	0	23.4	23.4	23.4

*Issue related

Environmental Consequences

Analysis of the environmental consequences from implementation of the action alternatives showed there would be minimal adverse effects to the physical and biological environment under management requirements and design features.

No federally Threatened or Endangered Species would be impacted by the proposed actions. It was determined that of the Regional Forester Sensitive Species (RFSS) only red-shouldered hawk and bats may be impacted, but no trend toward federal listing would result. The wood turtle would have a beneficial effect from the action alternatives.

The Responsible Official would compare alternatives by their effects to resources. Also how well the alternatives move toward or achieve the purpose and need for this project. Table 2 compares how each alternative moves toward or achieves the purpose and need. Reference to where this full comparison is found in the EIS is provided in the last column.

Table 2 below shows how each alternative addresses the purpose and need.

Purpose (Objectives)	**Desired condition**	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**	**Reference - EIS section #**
Forest age and composition modification						
Need 1A, Composition for MA 4B-Aspen	0-7%	22.8% short-term	20.2% short-term	26.9% short-term	26.6% short-term	Section 3.2.2
Need 1A, Composition for MA 4B-Jack pine	3-6%	8% short-term	6.4% short-term	6.4% short-term	6.8% short-term	Section 3.2.2
Need 1A, Composition for MA 4B-red/white pine	45-70%	34.4% short-term	37.7% short-term	35.9% short-term	35.5% short-term	Section 3.2.2
Need 1B, Composition for MA 2C-Aspen	15-30 %	57% short-term	52% short-term	57.5% short-term	57.5% short-term	Section 3.2.2
Need 1B, Composition for MA 2C-Northern Hardwoods	30-50%	8.4% short-term	13.9% short-term	8.4% short-term	8.4% short-term	Section 3.2.2
Need 2A, age class-Aspen 0-10, short-term	20%	2%	14%	0%	2%	Section 3.2.2
Need 2A, age class-Aspen 21-45, short-term	50%	58%	62%	0%	58%	Section 3.2.2
Need 2A, age class-Aspen 46+, short-term	10%	36%	19%	0%	35%	Section 3.2.2
Need 2C, age class-N. Hardwoods 0-20, short-term	16%	2%	2%	2%	2%	Section 3.2.2
Need 2C, age class-N. Hardwoods 21-60, short-term	32%	9%	16%	9%	11%	Section 3.2.2
Need 2C, age class-N. Hardwoods 61-100, short-term	32%	83%	76%	82%	80%	Section 3.2.2

Need 2C, age class-N. Hardwoods 100+, short-term	20%	7%	6%	7%	7%	Section 3.2.2
Need 2D, age class-jack pine 0-10, short-term	16%	6%	18%	15%	11%	Section 3.2.2
Need 2D, age class-jack pine 11-30, short-term	32%	59%	64%	64%	67%	Section 3.2.2
Need 2D, age class-jack pine 31-50, short-term	32%	13%	15%	17%	14%	Section 3.2.2
Need 2E, age class-red pine 0-20, short-term	15%	1%	4%	7%	4%	Section 3.2.2
Need 2E, age class-red pine 21-60, short-term	30%	44%	42%	42%	43%	Section 3.2.2
Need 2E, age class-red pine 61-100, short-term	30%	54%	50%	50%	51%	Section 3.2.2
Need 2E, age class-red pine 100+, short-term	25%	2%	2%	2%	2%	Section 3.2.2
Need 2F, age class-white pine 0-20, short-term	12%	6%	5%	6%	6%	Section 3.2.2
Need 2F, age class-white pine 21-60, short-term	24%	9%	11%	9%	9%	Section 3.2.2
Need 2F, age class-white pine 61-100, short-term	36%	82%	80%	81%	81%	Section 3.2.2
Need 2H, age class-N. red oak 20-59, short-term	38%	5%	11%	10%	11%	Section 3.2.2
Need 2H, age class-N. red oak 80+, short-term	24%	85%	74%	75%	75%	Section 3.2.2
Other vegetation management- see Section 4.2.1						
Need 3-Stream buffers in acres (no aspen regeneration zones)	Acres improved	0	232	29	89	Section 3.2.2

Need 5A-Stocking uneven aged hardwoods in acres	Reduce 194 acres stocking	0	194	194	64	Section 3.2.2
Need 5B-Stocking mixed hardwoods in acres	Reduce 179 acres stocking	0	179	179	118	Section 3.2.2
Need 5C-Stocking red pine in acres	Reduce 3,932 acres	0	3, 712	3,550	3,474	Section 3.2.2
Need 5D-Stocking white pine in acres	Reduce 314 acres	0	314	372	280	Section 3.2.2
Need 6A-Dry northern forest in acres	Acres restored	0	6,185	5,736	5,254	Section 3.2.2
Need 6B-Pine Barrens in acres	Acres restored	0	800	1,000	300	Section 3.2.2
Other activities						
Need 8-Reduce hazardous fuels in WUI (total number includes other needs)	Increased acres of fuel reduction	0	6,663	6,758	5,896	Section 3.4
Need 9- Reduce road density, Total RN in mi/sq. mi	Less than or equal to 4	5.2	3.9	3.9	3.9	Section 3.3

Decisions to be Made and Preferred Alternative

This EIS is not a decision document. Instead, its main purpose is to disclose the potential consequences of implementing the Proposed Action and alternatives to that action so that the Responsible Official, the District Ranger, can make an informed decision. Options include implementing the project as proposed, through the selection of one of the alternatives (including the No Action Alternative), or through a combination of alternatives. The preferred alternative at this time is Alternative 3.

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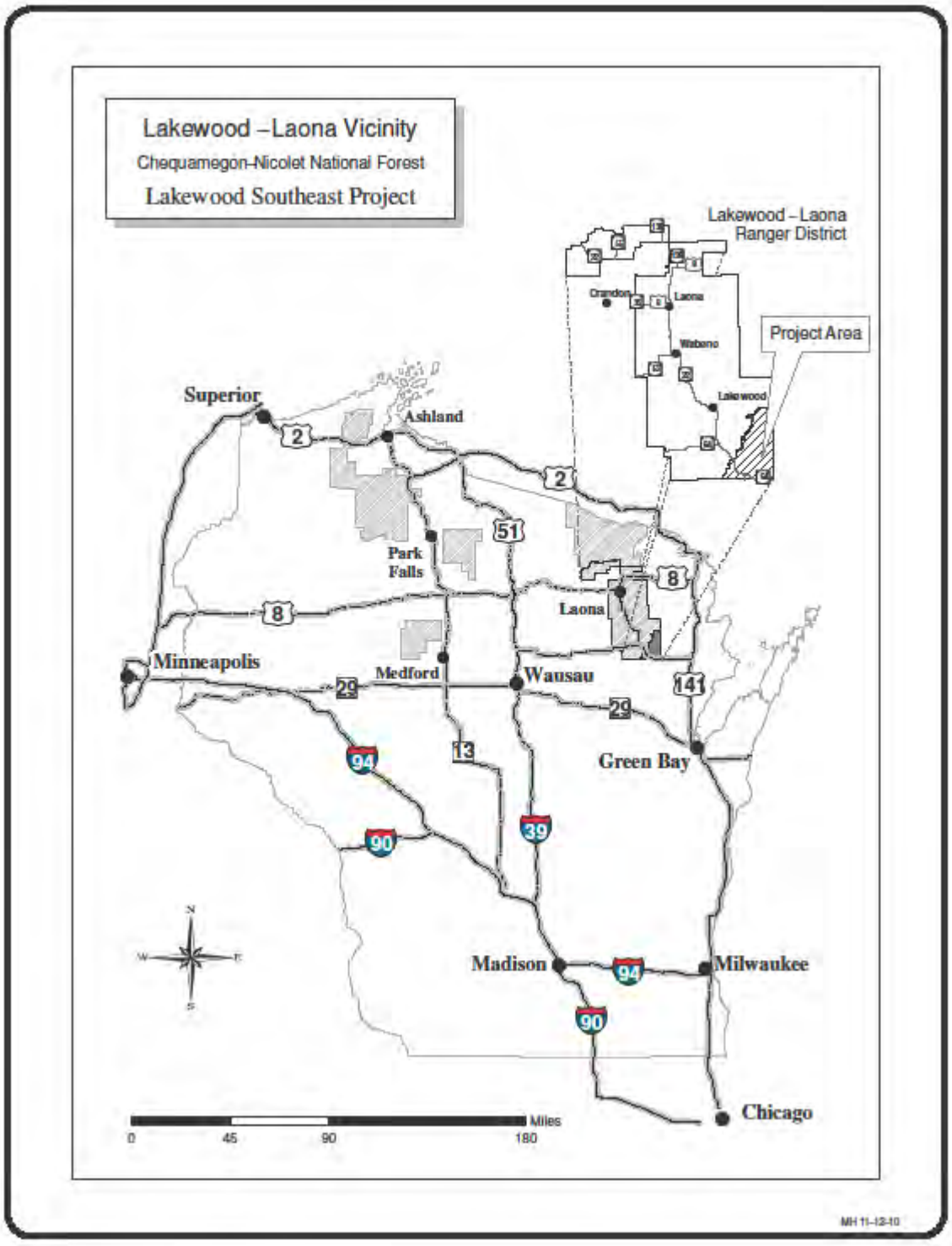
Lakewood – Laona Vicinity
Chequamegon-Nicolet National Forest
Lakewood Southeast Project
Lakewood – Laona Ranger District
Project Area
Crandon
Laona
Wabeno
Lakewood
Superior
Ashland
Park Falls
Laona
Minneapolis
Medford
Wausau
Green Bay
Madison
Milwaukee
Chicago
2
51
8
29
141
94
90
13
39
Miles
0
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90
180
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Document Structure

The Forest Service has prepared this Final Environmental Impact Statement (FEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This FEIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The organization of this document is in five chapters, shown below:

- **Chapter 1. Purpose and need:** The chapter includes information on the history of the project proposal, the purpose and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the CNNF informed the public of the proposal and how the public responded.
- **Chapter 2. Alternatives, including the proposed action:** This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. The IDT developed alternatives based on issues raised by the public and other agencies. This discussion also includes design features. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- **Chapter 3. Affected environment and environmental consequences:** This chapter describes the current conditions for each resource and the environmental effects of implementing the proposed action and other alternatives. Organization of this analysis is by resource area.
- **Chapter 4. Consultation and coordination:** This chapter provides a list of preparers and tribes and agencies consulted during the development of the FEIS.
- **Chapter 5. References:** References sited in this FEIS.
- **Appendices:** The appendices provide information that is more detailed.

Additional documentation, including more detailed analyses of project area resources in the project planning record, are located at the Lakewood Ranger District Office.

CHAPTER 1 PURPOSE AND NEED

1.1 Location and Background of Lakewood Southeast Project

1.1.1 Location (Geographic scope)

The Lakewood Southeast Project Area (project area) is located in the southeastern portion of the Lakewood Ranger District (see vicinity map) Southeast of Mountain, Wisconsin. The legal description of the area includes lands lying within the National Forest boundary in T30N, R16E, Section 1; T30N, R.17E, Sections 1, 4-6; T30N, R18E, Sections 5, 6; T31N, R16E, Sections 1, 12-14, 23-27, 33-36; T31N, R.17E, Sections 1-36; T31N, R18E, Sections 6, 7, 18, 19, 30 31; T32, R17E, Sections 1-5, 8-17, 20-36; T32N, R18E, Sections 6, 7, 18, 19, 30, 31; T33N, R17E, Sections 33-36; T33N, R18E, Section 31.

1.1.2 Management activity background (time frame) of the area

Several previous projects partly overlap the project area. However, the Killdeer Resource Management Project (3,155 acres), Southeast Pine (1,156 acres), and Big Swamp Resource Management Project (13,276 acres) covered most of the project area. Southeast Pine was the last analysis in the area; signed in 2001.

The main objectives of Killdeer, Southeast Pine, and Big Swamp were to improve wildlife habitat, manage roads, improve stream fish habitat, and move the area's composition and age class distribution towards forest plan objectives. The District implemented, under these documents, an array of timber harvests and associated forest management activities.

Since that implementation time, the forest has continued to grow and many of the stands have again, become overstocked. The District could harvest some of the stands in order to meet long-term objectives of the Chequamegon-Nicolet National Forest (CNNF) 2004 Land and Resource Management Plan (forest plan).

To accomplish the long-term objectives identified in the forest plan (see 'Purpose and Need' section below for details), the preliminary analysis of the project area indicated that there are certain conditions in need of action.

The Interdisciplinary team (IDT, see chapter 4 for members) did conduct an intensive analysis of the project area to determine its existing conditions. They also identified where the existing conditions differ from desired conditions, and proposed and analyzed activities that move toward the desired conditions (see need for change documents and forest wide age and composition vegetation spreadsheet in the project record, volume 1, section A).

1.2 Purpose and Need

The project area contains approximately 36,939 acres of National Forest lands. Within the project area, the forest plan allocated the majority of the lands to Management Areas (MA) 4A (Conifer: red-white-jack pine), 4B (Conifer: natural pine oak), 8F (Special management areas), and 8G (Old growth and natural feature complexes). Also included in the project area are MAs 2A (Uneven aged Northern Hardwoods), 2C (Uneven-aged northern hardwoods: mixed forest), 3C (Even-aged hardwoods: oak-aspen), and 8E (Existing and candidate research natural areas).

Table 1.1: This table shows MA acres

MAs	MA 2A	MA 2C	MA 3C	MA 4A	MA 4B	MA 8E	MA 8F	MA 8G
Acres	9	366	101	15,585	10,299	304	3,987	6,288

1.2.1 Existing condition vs. desired conditions in the project area

Vegetation Conditions - *Species Composition*

Composition overview of the project area current condition

The primary upland forest types are red and white pine (33 percent), aspen (26 percent), and northern hardwoods (16 percent). See Table 1.2.1.1 for details of the project's forest type breakdown (Forest Vegetation Report, Project Record [PR] volume 5). The majority of the upland forest stands are classified as is in a middle age class.

Table 1.2.1.1: This table shows the project's forest type composition for upland and lowland forest types

FOREST TYPE	ACRES	%
Upland types		
Aspen	6,987	25.7%
Balsam	819	3.0%
Paper Birch	179	0.7%
Jack Pine	1,928	7.1%
Red and White Pine	8,949	32.9%
Northern Hardwood	4,237	15.6%
Oak	2,027	7.5%
Upland Openings	1,774	6.5%
Other Types	284	1.0%
Summary Uplands	*27,183*	*100.0%*
Lowland types		
Lowland Conifer	5,228	53.6%
Lowland Hardwood	3,227	33.0%
Lowland Openings	1,308	13.4%
Summary Lowlands	*9,763*	*100.0%*
Total All Acres	**36,945**	

The lowlands in the project area are about 54 percent lowland conifer swamps, 33 percent lowland hardwoods, and about 13 percent lowland openings.

The rest of the discussion in this section would focus on the upland forest types. The IDT has not proposed any activities in the lowland areas.

Need #1- Composition by MA (PR volume 5)
The project area is divided into forest plan management areas (MAs) with related desired future conditions (DFCs). The majority of this discussion on vegetation would be in the context of these management areas. Only the management areas that would be affected would be included in this discussion.

The CNNF is divided into numerous management areas, each with specific emphases and desired future conditions. Movement toward these DFCs is intended at the forest level. However, given the large size of the CNNF, the compositional changes generated by individual projects like Lakewood Southeast would usually be small and hard to show at the forest level. For this reason, manager's measure project-level effects at the scale of the local forest plan MAs, since the differences would be easier to see at this scale.

In this analysis, the existing condition and project effects on composition would be displayed at the project and forest levels. This project will concentrate on correcting MA 4B, other MA's are only a minor part of this action. More discussion on these MAs and their management implications is included below (except the MA 8's-see section 3.10.2).

<u>Need 1 A- Management Area 4B</u>
A large portion - about 35 percent (10,299 acres) of the CNNF in the project area falls within MA 4B. This management area emphasizes conifer: natural pine-oak. Table 1.2.1.2 summarizes the existing upland forest composition for MA 4B (forest plan MA objective p. 3-19):

Table 1.2.1.2: Existing upland forest composition in MA 4B

Management Area 4B		**Project Area**		**Forestwide**	
Upland Type	Desired	Acres	Existing	Acres	Existing
Aspen	0-7%	2423	27.0%	6435	24.3%
Balsam Fir	0-3%	181	2.0%	531	2.0%
Paper Birch	0-5%	0	0.0%	1459	5.5%
Jack Pine	3-6%	716	8.0%	2212	8.4%
Red Pine/White Pine	45-70%	3085	34.4%	7508	28.3%
Northern Hardwoods	0-10%	729	8.1%	3207	12.1%
Oak	10-25%	1149	12.8%	2863	10.8%
Permanent Openings	2-8%	662	7.4%	2166	8.2%
Other Types	0-10%	14	0.2%	107	0.4%
Summary Uplands		8960	100.0%	26488	100.0%

Table 1.2.1.2 illustrates that most of the forest types in the project area fall within (or close to) the range of desired conditions given in the forest plan for MA 4B (Management Area Direction, p. 3-19, Table 3-11). The exceptions are aspen, red, and white pine. For these species there is a need to move from existing condition toward the DFCs (from the forest plan), each is described below.

The maximum amount of aspen desired in MA 4B is seven percent (627 acres). The existing amount of aspen in MA 4B is 27 percent (2,423 acres). There is a need to convert about 1,796 acres of excess aspen to other vegetation types to meet the desired condition for MA 4B.

The desired condition's minimum amount of red and white pine in the MA 4B is 45 percent (4,032 acres). The existing amount of red and white pine in this area is 34 percent (3,085 acres). Therefore, there is a need to convert 947 acres of other species to red and white pine within MA 4B in the project area.

There is a small excess (six percent or 538 acres) of jack pine compared to forest plan maximum DFC for composition in MA4B. The existing condition is eight percent (716 acres) for MA 4B. There is a need to convert about 719 acres of jack pine in MA 4B to other vegetation types to meet the desired condition.

<u>Need 1B, other MA's</u>
Management Area 2C
A very small area – about one percent (366 acres) of the CNNF lands in the project area are within MA 2C. This management area emphasizes Uneven-aged northern hardwoods- mixed forest. Table 1.2.1.3 summarizes the existing upland forest composition for MA 2C (forest plan MA objective, p. 3-10):

Table 1.2.1.3: Existing upland forest composition in MA 2C

Management Area 2C		Project Area		Forestwide	
Upland Type	**Desired**	**Acres**	**Existing**	**Acres**	**Existing**
Aspen	15-30%	195.5	57.5%	62044.6	30.7%
Balsam Fir	0-3%	80.4	23.7%	5512.9	2.7%
Paper Birch	0-5%	0	0%	3099.7	1.5%
Jack Pine	0-2%	0.0	0.0%	1077.7	0.5%
Red Pine/White Pine	10-30%	33.4	9.8%	21242.3	10.5%
Northern Hardwoods	30-50%	28.6	8.4%	92821.6	45.9%
Oak	0-10%	0.0	0.0%	2602.6	1.3%
Permanent Openings	1-2%	2.2	0.6%	3519.7	1.7%
Other Types	0-15%	0.0	0.0%	10253.0	5.1%
Summary Uplands		**340.1**	**100.0%**	**202174.1**	**100.0%**

Management Area 4A

The largest portion - about 42.2 percent (15,585 acres) of the CNNF in the project area falls within MA 4A. This management area emphasizes conifers: red-white-jack pine. Table 1.2.1.4 summarizes the existing upland forest composition for MA 4A (forest plan MA objective p. 3-18):

Table 1.2.1.4: Existing upland forest composition in MA 4A

Management Area 4A		Project Area		Forestwide	
Upland Type	**Desired**	**Acres**	**Existing**	**Acres**	**Existing**
Aspen	10-30%	3628	27.2%	32870	28.6%
Balsam Fir	0-3%	362	2.7%	1547	1.3%
Paper Birch	0-5%	128	1.0%	2425	2.1%
Jack Pine	0-35%	1174	8.8%	13413	11.7%
Red Pine/White Pine	10-50%	4739	35.5%	41755	36.3%
Northern Hardwoods	0-25%	2076	15.6%	9188	8.0%
Oak	0-25%	592	4.4%	9349	8.1%
Permanent Openings	1-6%	568	4.3%	3094	2.7%
Other Types	0-5%	67	0.5%	1443	1.3%
Summary Uplands		**13335**	**100.0%**	**115083**	**100.0%**

Need #2 - Species Age Class Distribution-(Forest Vegetation Resource Report, PR volume 5)

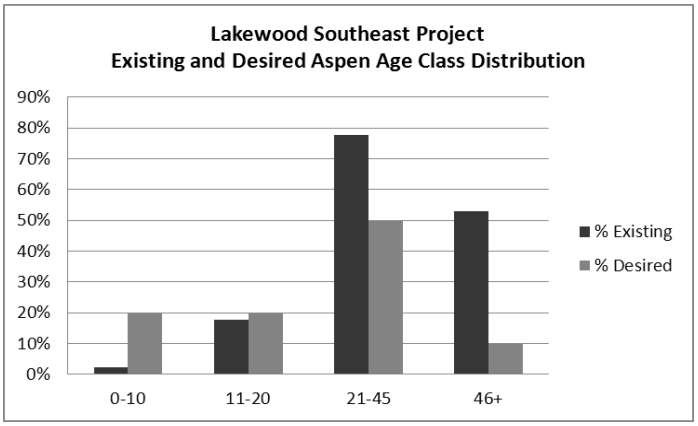
Since desired age class distributions are forest wide guidelines (see p. 2-5 thru 2-13 of the forest plan) without respect to management areas, it is appropriate to review existing age class distributions at the project area and forest wide scales.

Need 2A - Aspen

Aspen is a short-lived, shade-intolerant species that has high value to many wildlife species; some people are concerned that the amount of aspen on the landscape has been steadily decreasing since the time of "The Cutover." In the Lakewood Southeast Project Area, the concern is that older aspen stands may not be allowed to break up and convert to other types; rather, they may be regenerated to young aspen stands- thus maintaining the aspen type at or close to its current level in the project area.

Table 1.2.1.5: Existing aspen age class distribution

Age Class	Desired Condition %	Desired Condition (acres)	Existing % in the project area*	Existing Acres in the project area	Existing Forest wide
0-10	20%	925	2%	107	4%
11-20	20%	925	18%	825	12%
21-45	50%	2314	78%	3599	45%
46+	10%	463	53%	2456	39%
*figures add up to 151% since existing aspen composition is 151% that of DFC.					



There is an overabundance of aspen in the two oldest age classes and there is a lack of representation in the youngest age class. This is the case within both the project area and CNNF. It is for this reason that one of the project's primary purpose is to regenerate older aspen stands in accordance with forest plan direction.

To meet the Desired Future Condition of 20 percent of the aspen in the young age class (forest plan guideline p. 2-5) about 818 acres of aspen may be regenerated. The majority of this acreage could be taken from the 46+ age class. Assuming an 18 percent reduction from that age class, 35 percent of the old age aspen would remain. However, much of this remaining 35 percent of old age aspen would be converted to pine types in order to meet composition objectives. A combination of type conversion and regeneration of some of the remaining older aspen would result in a picture that would be much more closely in line with the desired condition.

Need 2B - Paper Birch

Occupying only 179 acres (only128 acres is included within management areas open to timber management), paper birch is not an abundant species within the Lakewood Southeast Project Area. Nonetheless, the forest plan gives guideline direction (p. 2-6) to manage the CNNF's paper birch resource with 25 percent in each of the age classes as shown in Table 1.2.1.7. Paper birch is a sun-loving species that regenerates areas after widespread disturbances, such as stand-replacement fires. This short-lived species must be regenerated using even-aged methods (forest plan FEIS appendix F, p. F-8 and F-9; Perala and Alm, 1989). It also regenerates best when mechanical site prep, such as the use of a salmon blade, follows the harvest. If not regenerated by disturbance, the paper birch type would be replaced by more tolerant species types, such as oak or northern hardwoods.

Within the project area, 100 percent of the paper birch is presently aged 60 or older. This is beyond the standard rotation age and is approaching the extended rotation age given in the forest plan (p. 2-4). If this birch were not regenerated during the next 20 years, it would most likely convert to other more tolerant types through natural succession. However, all but seven acres of this birch is located in MA 8F and 8G. Timber management is not allowed in these MAs; therefore, the topic of birch age class distribution would not be discussed any further.

Table 1.2.1.6: Paper birch age class distribution

Age Class	Desired Condition	Existing in project Area	Existing Forestwide
0-20	25%	0%	4%
21-40	25%	0%	1%
41-60	25%	4%	2%
61+	25%	96%	93%

Need 2C - Northern Hardwoods

Within the Lakewood Southeast Project Area are approximately 4,240 acres of northern hardwood types. Northern Hardwoods are forest types that are dominated by sugar maple. Northern hardwood stands can be highly variable and typically contain a wide variety of species, including white ash, red maple, basswood, yellow birch, beech, and hemlock. Other associates may also be present, such as aspen, paper birch, and pine species.

Because many of the northern hardwood species are more shade tolerant, these stands can be managed under a wide variety of silvicultural systems. Most commonly, they are managed under the uneven-aged singletree selection method or the even-aged shelterwood method.

Within the project area, however, due to the sandier soils, most of the hardwood stands have strong components of pine, oak, and mid-tolerant hardwood species. These types lend themselves well to even-aged management, which is emphasized in the majority of the project area (see forest plan, p. 3-17 thru 3-19). The IDT estimated that about 90 percent of the hardwoods in the project area would be good candidates for even-aged management. The IDT spatially reviewed the edaphic and vegetative conditions and determined the conditions in the project area are reasonably capable of providing 90 percent of the upland hardwoods in this condition. To meet the goals of MA 4, this level was determined by the team as the benchmark against which to measure our maximum attainment of this desired condition.

Table 1.2.1.7: Northern hardwoods age class distribution

Age Class	Desired Condition	Existing in the project area	Existing Forest wide*
0-20	16%	4%	2%
21-60	32%	12%	2%
61-100	32%	80%	76%
101+	20%	5%	8%

*There are also about 12% uneven-aged hardwood

Currently, the age class distribution of the hardwood types differs from the desired condition identified in the forest plan. There is an overabundance of acreage in the 61-100 year age class and a shortage of acreage in the 0-20 year age class. It is estimated that, in order to achieve the

DFC for hardwood age class distribution (guideline p. 2-8 and 2-9), about 1,600 acres of 61-100 year old stands would need to be shifted to other age classes- either older or younger. At the same time, the 0-20 year age class would need to be increased by about 525 acres. It would be impossible to meet these two objectives at the same time. It may be possible to increase the young age class by 525 acres (presumably by regenerating that amount of 61-100 year old stands, leaving excess in that age class). However, to meet the DFC for the oldest age class, we would have to convert all 1,600 acres, which would cause an excess in the young age class (therefore not meeting its' DFC).

No set of treatments today would instantly change the project area to meet all DFCs in the forest plan. This would take many entries and much time. However, some actions that could be taken today would move the area toward those DFCs.

No northern hardwood stands in the project area are currently *uneven*-aged- that is, containing three or more distinct age classes. About 10 percent of the hardwoods in the project area would be good candidates for management under an uneven-aged system. We've identified approximately 300 acres of hardwoods within the project area that are good candidates for uneven-aged management and which currently exceed desired stocking levels. These have been proposed for individual tree selection harvest.

Need 2D - Jack Pine

Within the project area, there is approximately 1,930 acres of jack pine, or on seven percent of the area. Jack pine is a very shade intolerant pioneer species that regenerates following widespread stand replacement disturbances, such as fires or clearcuts. It is a short-lived species and is best managed under the even-aged system using the clearcut method. This is the optimal method for regenerating this species (forest plan appendix F, p. F-5 and F-6; Benzie, 1977). If it were not regenerated, more shade tolerant species, such as oak or red maple would gradually take over the site.

Table 1.2.1.8: Jack pine age class distribution

Age Class	**Desired Condition**	**Existing in the project area**	**Existing Forest wide**
0-10	16%	6%	9%
11-30	32%	59%	55%
31-50	32%	13%	7%
51+	20%	22%	29%

Jack pine has been aggressively managed in the project area over the past 40 years. Much of planting in the mid to late 1930s began to decline in the mid-1970s and, as a result, there was a large-scale salvage program in the project area in the late '70s and early '80s.

Following the salvage, most of the areas were replanted to jack or red pine. Consequently, unlike many of the other species, jack pine does not have a large "bubble" of acreage in the oldest age class; rather, it has a "bubble" in the 11-30 year age class.

There is also a shortage of representation in the 0-10 year age class (forest plan guideline p. 2-7). About 150 acres of new jack pine regeneration would be needed to increase the current six percent to the desired 16 percent in the young age class.

A reduction of about 90 acres is also desired in the 51+ age class. These figures reflect the desired reduction in MA 4B jack pine composition.

Need 2E - Red Pine

Red pine occupies about 7,356 acres (27 percent) of the Lakewood Southeast Project Area's uplands- a considerable component of the upland vegetation. Red pine is intolerant of shade, but more tolerant than species such as aspen, paper birch, and jack pine. It is best managed under even-aged conditions (forest plan FEIS appendix F, p. F-6). Desired age classes for red pine are given in the forest plan (p. 2-10) and are displayed in Table 1.2.1.9.

Table 1.2.1.9: Red pine age class distribution

Age Class	Desired Condition	Existing in Project Area	Existing Forestwide
0-20	15%	4%	6%
21-60	30%	43%	42%
61-100	30%	52%	50%
101+	25%	1%	2%

Thirty-three percent of the red pine in the project area was planted in the era of the Civilian Conservation Corps. Planting records from the 1930s and early 1940s describe the planting of vast areas in the project area. The 69-77 year-old stands comprise a "spike" in 61- 100-year-old stands. On the other hand, there is a shortage of red pine stands 0-20 years of age. At the forest level, the red pine age class distribution is congruent with this pattern, varying little.

There is a need to increase red and white pine composition within the project area. Likewise, there is also a need to increase representation in the 0-20 year age class while also reducing representation in the 61-100 year age class (forest plan guideline p. 2-10). These two objectives would need to be pursued concurrently.

Need 2F - White Pine

Table 1.2.1.10: White pine age class distribution

Age Class	Desired Condition	Existing in the project area	Existing Forest wide
0-20	12%	6%	8%
21-60	24%	9%	3%
61-120	36%	82%	80%
121+	28%	3%	9%

White pine occupies about 1,593 acres, or about six percent of the project area. White pine is intermediate in shade tolerance. It can become established under the canopy of overstory trees and sometimes persist under considerable shade. White pine grows best under open conditions. However, it can be easily out-competed by faster-growing species. For this reason, white pine generally does best under partial shade.

It can be managed in a number of ways, but the shelterwood method is generally considered the most effective (forest plan FEIS appendix F, p. F-10). Due to its many ecological values, white pine is frequently planted in the understories of existing stands. White pine was extensively logged in parts of the area during the late 1800s. What remains today in the Lakewood Southeast Project Area is undoubtedly a fraction of what formerly existed. During the CCC Era, white pine plantations were planted in the project area, but not to the extent of the red pine. About 31 percent of the white pine in the project was planted between 1933 and 1942.

As shown in Table 1.2.1.8, the vast majority of the white pine in the project area is greater than 61 years of age. Since these age classes are over represented (forest plan guideline p. 2-12), an opportunity exists to convert some of the area to the young age class through regeneration harvests. Opportunities also exist to increase the young white pine component through under-planting, especially along riparian corridors.

The District and the project area are pine country. While the representation of white pine as a type is not great, understory white pine regeneration is widespread in this area. The natural trend is a return to white pine on the Lakewood Southeast Project Area landscape.

Need 2G - Balsam Fir

At about 820 acres in the uplands, balsam fir comprises about three percent of the Lakewood Southeast Project Area. Balsam fir has a strong ability to become established and to grow under the shade of larger trees. It is classified as very tolerant. Typically, balsam fir grows in mixed stands with paper birch, aspen, maple, and other species. Balsam fir stands break up at young ages and tend not to persist into old ages. In the absence of disturbance, the sites tend to become occupied by longer lived and more shade tolerant species such as red and sugar maple. Rotation ages are generally between 45- 60 years of age depending on the site and the risk factors (forest plan FEIS appendix F, p. F-8).

Table 1.2.1.11: Balsam fir age class distribution

Age Class	**Desired Condition**	**Existing in the project area**	**Existing Forest wide**
0-10	20%	0%	2%
11-30	40%	17%	5%
31-45	30%	7%	14%
46+	10%	75%	80%

Balsam fir can be managed under both even and uneven-aged silvicultural systems. Even-aged systems are the preferred method. Under even-aged systems, Table 1.2.1.9 displays the desired age class distribution (forest plan, p. 2-11). Also shown is the existing condition in the project area.

Currently, there is a great overabundance of balsam fir in the 46+ year age class and a lack of any in the 0-10 year age class (forest plan guideline p. 2-11). This presents an opportunity to regenerate some older stands to move conditions more in line with desired conditions. However, opportunities maybe limited because many of these stands are small, or isolated. In addition, some stands have conflicting management objectives.

Need 2H - Northern Red Oak

Northern red oak occupies about 1,593 acres, or about six percent, of the project area. Northern red oak is classified as intermediate in shade tolerance. It is less tolerant of shady conditions than some species, such as sugar maple, beech, or hemlock; yet is more shade tolerant than other species, such as aspen and white ash.

Oak stands are best managed under even-aged silvicultural systems. They are most commonly regenerated using the shelterwood method (forest plan FEIS appendix F, p. F-10 and F-11).

Table 1.2.1.12: Red oak age class distribution

Age Class	Desired Condition	Existing in project area	Existing Forestwide
0-19	19%	3%	2%
20-59	38%	5%	2%
60-79	19%	20%	27%
80+	24%	72%	69%

Currently, within the project area, there is an overabundance of oak in the 80+ year age classes and shortage of stands in the 0-19 year age class (Table 1.2.1.12). In the 0-19 year age class, there is a 16 percent shortage when compared to the forest plan's desired conditions. This equates to the need to regenerate about 330 acres of oak.

There is a substantial overabundance of oak acres in the 80+ age class (forest plan guideline p. 2-9). This is the standard rotation age for most of the oak stands in the project area. In order to move the 80+ year age class to the DFC, about 980 acres of oak would need to be regenerated. It is not realistic to do this at this time. Oak is a challenging species to regenerate, because it is a weak competitor against many of its associate species. For successful regeneration of older oak stands to well-stocked young oak stands, several shelterwood preparation cuts are usually needed. Therefore, there is a need to begin the process of regenerating some of these older stands. Some of these treatments may effectively swap 80+ year old stands for 0-19 year old stands, but this would have to be contingent on the level of successful oak reproduction realized.

Need # 3 - Selected trout stream management (Forest Vegetation and Water Resource Reports, PR volume 5)
There are currently 764 acres of aspen within the selected trout stream buffer zones in the project area. Little Waupee Creek and Waupee Creek are selected trout streams (forest plan guideline p. 2-17 and appendix DD-2), where aspen regeneration is not desired within 450 feet distance of these streams and their tributaries. This project area also contains several Class I (not selected) and Class II trout stream that require a 300-foot buffer with no aspen generation. The long-term desired future condition for these stream buffers is to have more long-lived, shade-tolerant species. There is a need to convert aspen to other long-lived species within these stream buffers. Aspen regeneration immediately adjacent to the stream (within 300 - 450 feet) could have an indirect effect on the streams by providing ample supplies of the preferred food source for beaver; therefore, encouraging beaver colonization. This colonization which can adversely affect trout habitat by blocking migration, reducing shade through flooding, increasing water temperature, causing sedimentation of spawning areas, and altering habitat which causes increased competition from other fish species.

Need # 4 - Species diversity (Forest Vegetation Resource Report, PR volume 5)
Currently many areas within the project area lack diversity. There is a need to increase tree stand and species diversity in many stands within the project area to meet the desired condition (forest plan guideline p. 2-25). Planting white pine or hemlock in the understory would increase species diversity, improve long-term wildlife habitat value, reduce susceptibility to insects or diseases, and increase future management options.

Need # 5 - Stocking (Forest Vegetation Resources Report, PR volume 5)
The preliminary analysis for the Lakewood Southeast Project showed that there are stands that currently exceed desired stocking levels. Forest plan guideline (p. 2-8 and 2-10, FF1 through FF-3) shows the desired stocking levels. See the discussion of each species in the paragraphs below for differences between current and DFC.

Need 5A – Uneven-aged Hardwood
There are currently no uneven-aged hardwoods in the analysis area; however, there are about 194 acres of overstocked even-aged northern hardwood stands within the analysis area that are good candidates for uneven-aged management. The forest plan's desired condition (guideline p. 2-8) recommends stocking levels in managed uneven-aged northern hardwood stands to maximize growth and quality of forest products. Therefore, there is a need to move some of the northern hardwoods in the project area toward uneven-aged conditions to meet the forest plan.

Need 5B - Mixed Hardwood
Currently there are about 179 acres of mixed upland hardwood stands that exceed the stocking levels desired in the forest plan (see FF-1 through FF-2). Reducing the stocking of these stands would maximize growth and improve stand health. Therefore, there is a need to reduce stocking in even-aged mixed hardwood types within the project area.

Need 5C - Red Pine
There are about 3,632 acres of red pine types in the project area that are (or soon would be) in need of density management. This includes about 1,800 acres of stands that are currently in excess of desired stocking levels (forest plan guideline, Table 2-9, p. 2-10) and another 1,800 acres that would exceed the desired stocking levels within the next 5 years. This gap shows a need to reduce the stocking levels of these stands, which would maximize growth and improve stand health.

Need 5D - White Pine
Currently there are about 314 acres of white pine types in the project area that are in need of density management. Addressing this need would reduce the density of these stands, which would maximize growth and improve stand health.

Communities of concern (Forest Vegetation Resource Report, PR volume 5)
Currently within the Lakewood Southeast Project Area are forest communities that have become increasingly rare or altered with the absence of their primary natural disturbance agent- fire.

The desired condition from the forest plan is Goal 1.2 calls for protecting ecological communities of special concern. Goal 1.4 also calls for providing terrestrial ecosystems in healthy, diverse, and productive conditions that support the diversity of plant and animal communities and tree species, and have a high likelihood of supporting the viability of native and desired non-native vertebrates and vascular plants. There is a need to restore these two ecosystems by reintroducing fire: Northern Dry Forest and Pine Barrens to meet the desired conditions in the forest plan (Goal 1.2 and 1.4). This would be done by prescribed fire and harvest (see appendix A and C for locations).

Need 6A - Northern Dry Forests
Northern Dry Forest plant communities dominate the project area. These are pine or pine-hardwood dominated communities found on dry sandy soils occurring mainly on sandy glacial outwash and sandy glacial lake plains and sand ridges. Prior to European settlement, Northern Dry Forest typically originated in the wake of catastrophic fire, and frequent, low-intensity ground fires maintained red pine systems.

Over the past 80 years, people have largely excluded fire from these ecosystems through aggressive fire suppression policies and minimal use of prescribed fire. The removal of fire from the northern dry forest has altered stand densities, species composition, and age class distributions. Stands are generally more dense, contain more fire-intolerant species, more oaks, and understory grasses and forbs are less robust and prevalent.

Forest plan objective 1.4c (p. 1-3) gives direction to restore and/or emulate natural disturbance regimes historically present within pine communities. Both IDT and Wisconsin Department of Natural Resources (WDNR) have identified the project area as having a major opportunity to manage for Northern Dry Forest communities (Pohlman et al, 2006).

To meet the Northern Dry Forest restoration need, the IDT proposes harvest treatments (reduce stocking, improve species diversity), and reintroduce fire in portions of the project area. Harvest treatments would change the current high-density forests in the area to variable-density conditions. Under-planting and timber stand improvement activities would aid in the establishment of white pine and other desirable species. Prescribed fire would encourage the herbaceous understory and reduce woody fire-intolerant species.


Pine Barrens. Note the single mature red pine, lack of brush, high proportion of grasses and forbs, and general openness.


Candidate barrens restoration area east of Airport Road.

Need 6B - Pine Barrens (see pictures) are types of savanna plant communities that occur on sandy soils and are dominated by grasses, low shrubs, small trees, and scattered large trees. Historically, Pine Barrens covered 2.3 million acres (seven percent) of Wisconsin's pre-settlement landscape (Eckstein and Moss, 1995). Pine Barrens are highly variable in nature and can be difficult to characterize. However, one thing that they all have in common is that they tend to be open landscapes on sandy soils that are subject to frequent fires.

Because of the exclusion of fire on the landscape, Pine Barrens have become quite rare. They remain scattered on an estimated 10,000 acres statewide. The WDNR Natural Heritage Inventory program (WDNR, 2007) considers Pine Barrens imperiled because they have become so rare, both globally and in the state of Wisconsin. The District proposes to

maintain or restore Pine Barrens in Wisconsin due to a great concern that many rare species of flora and fauna depend on barrens habitat.

Forest plan objective 1.4b (p.1-3) gives direction to restore and/or emulate natural disturbance regimes in Pine Barrens. Forest plan objective 1.4h (p. 1-3) calls for the increased use of prescribed fire as a management tool within fire-adapted Land Type Associations. Forest plan objective 1.4l (p. 1-3) calls for the maintenance and enhancement of existing pockets of barrens and savanna habitat. The lands within the project area have long been recognized for their barrens restoration potential. The Northeast Sands Wisconsin Land Legacy Report (WDNR, 2006) identified this area as having one of the highest potential restoration values for Pine Barrens and Northern Dry Forest. Eckstein and Moss (1995) encouraged the District to explore opportunities for barrens restoration.

There is a need and an opportunity to restore Pine Barrens Ecosystems in the Lakewood Southeast Project Area. This would include burning up to 1,000 acres east of Airport Road-a former Pine Barrens. The IDT has identified a specific area within that area that has exceptional Pine Barrens/savanna restoration potential. This is an area (east of Airport Road, west of the CNNF boundary, and north of Old Highway 64) historically maintained by frequent fire. Most of the ecosystem components (such as the appropriate tree species, grasses, and soils) are present that would enable a fairly quick and effective restoration that approximate historic conditions (see objective in section 1.2.2).

The District proposes to restore the Pine Barrens through a combination of timber harvests and prescribed fire. Harvest treatments would change the current high-density forests in the area to low density, open conditions dominated by grasses, shrubs, red pine, and jack pine. Following harvest, the District would treat most of the area with prescribed fire to reduce fuel loads and to restore grasses and forbs. This would be the initial step in restoring the landscape to its historical composition. The careful use of periodic maintenance burns would then mimic the historic fire regime and its effects on the ecosystem.

Need #7- Wildlife habitat improvement opportunities in this project (BE and Management Indicator Species [MIS] and Management Indicator Habitats [MIH] Reports, PR volume 5)
Need 7A
There is an opportunity and a need to maintain upland forest openings for wildlife (location chart in the project file). Currently, these forest upland openings are scattered throughout the project area in a variety of sizes. Over time, brush and other competing vegetation has encroached on these openings. The desired condition is to maintain numerous permanently non-forested areas as one way of providing a variety of habitats for wildlife (forest plan, guidelines on p. 2-4, 2-15, and 2-16). The gap between the current and desired condition shows a need to maintain forest upland openings in an open condition for the benefit of a number of wildlife species. The District proposes to fill this gap by removing vegetation with prescribed fire, mechanical means, or hand tools. Alder management is included in the mechanical habitat improvement work. This work would create temporary openings and early successional habitat used by American woodcock and golden winged warblers. The WDNR lists the woodcock and golden-winged warbler as Species of Greatest Conservation Need.

Need 7B
There is an opportunity and a need to improve long-term nesting habitat for red-shouldered hawks (RFSS) and northern goshawks (MIS). The area's hardwood stands currently lack a large conifer (hemlock and white pine) component that is an important part of high quality nesting habitat. The desired conditions from the forest plan encourage the planting of these two tree species where opportunities are present (objective 1.4j, p. 1-4). The gap between the current and desired conditions shows a need to improve the nesting habitat within the project area for these species.

Both species of raptors utilize hemlock or pine branches to decorate the top of the nest during breeding season to attract potential mates. They will also use these branches to line the inside nest cup for sanitation, warmth and comfort while raising their young. Small scattered stands of pine and/or hemlock within large upland hardwood stands provide habitat diversity for variety of prey species.

Need 7C
There is an opportunity and a need to protect terrestrial habitat and create wood turtle (RFSS and State Threatened) nesting sites within the project area. There is only one communal wood turtle-nesting site on the district and it is located in the project area. There are many other smaller/individual sites located adjacent to roads, which increase the possibility vehicles killing turtles. The forest plan refers to the importance of communal nesting sites on the CNNF (forest plan guideline, p. 2-22). Ideal sites for creating nesting area would be less than an acre and placed in stands adjacent to streams on sandy soils with south facing slopes.

Need #8 - Reduce hazardous fuels within the wildland urban interface (Fuels Resource Report, PR #5)
This project would move toward protecting private property adjacent to national forest from wild fires. The paragraphs below explain the historic, current, and desired condition for fuels and fire in the project area; as well as the need for action.

The eastern extent of the project area is located on a large sand outwash plain that is subject to extended drought conditions. The vegetation in this area is fire-adapted and burned frequently prior to human development.

Within the project, there are hundreds of homes, family cottages, and businesses. Currently, there are many Wildland Urban Interface (WUI) areas (CNNF adjacent to private properties) where the fuel profiles would pose a hazard to life and property in a wildfire.

The WUI that surrounds the Airport Road area (about 1,000 acres) is at the greatest risk of a wildland fire. The District has identified numerous timber stands on national forest lands within the project area that contain hazardous fuel conditions and need treatment. In addition to timber stands with fuel hazards, there are also stands in the WUI that are overstocked, in an unhealthy condition, or have the potential to be converted to less flammable forest types.

The forest plan's guideline (p. 2-25) desired condition is to "focus fuels reduction activities within the urban interface and areas surrounding the communities at risk."

There is a need to reduce hazardous fuels adjacent to private homes and property in the project area. Reducing the amount of ladder fuels and flammable fuels within these stands could reduce the size and occurrence of catastrophic crown fires. This reduction in fuels would increase firefighters' ability to safely and effectively control wildfires.

Fire would also be used to support other project needs, such as maintaining wildlife openings and Pine Barrens, managing for composition and age class, fuel reduction, etc. Due to the complexity of this management, multiple fires maybe needed to reach those project goals.

Need #9 - Access management of the road system in Lakewood Southeast Project (Transportation System Report or TAP, PR #5)
Within this road system there is a need to reduce road density, add barriers to closed non-motorized roads, and adapt the road system for administrative use to meet the desired conditions (discussed below). These road management activities are in conjunction with the forest's travel management and the project's travel analysis (TAP-see project record volume 1, B-10).

The IDT completed the TAP for the project area and showed that current road mileage exceeds the density of roads in some parts of the project area. This project proposes to reduce road density in the project area (based on the need from the TAP to reduce local road density). Road density from the forest plan (see p. BB-1) is forest-wide for the CNNF. The forest plan's direction is to reduce average open and total road density (objective 3.1 p. 1-7). Table 1.2.1.11 below shows the gap between current and desired road density.

Table 1.2.1.13: Open and total road density (DFC, forest plan goal 3.1 p. 1-7 and BB-1)*

Recreation opportunity spectrum class	**Desired future condition from forest plan**	**Existing condition within project area**
Non-motorized	$\leq$ 0 mi. /sq. mi. of open road.	1.2 mi./sq. miles
Non-motorized	$\leq$ 3 mi. /sq. mi. of total road.	4.25 mi./sq. miles
Roaded natural remote	$\leq$ 2 mi. /sq. mi. of open road.	3.25 mi./sq. miles
Roaded natural remote	$\leq$ 3 mi. /sq. mi. of total road.	3.84 mi./sq. miles
Roaded natural	$\leq$ 4 mi. /sq. mi. of open road.	3.60 mi./sq. miles
Roaded natural	$\leq$ 4 mi. /sq. mi. of total road.	5.19 mi./sq. miles

*Total road density includes both open and closed roads.

The project area includes a non-motorized area (see the MA maps on the web for this area) that currently includes closed roads on the Motorized Visitor Use Map (MVUM). There are no barriers to block motorized use on these closed roads (Table 1.2.1.11). The desired condition is to move towards forest plan's objectives in providing non-motorized recreation experience (forest plan goal 2.1, p. 1-4) as part of "maintain and enhance diversity and quality of recreation experiences..." Therefore, there is a need to block these closed roads to motorized use in the project area. The District proposes to block these roads by decommissioning, removing the roads from the MVUM, installing gates or barriers, and/or creating parking areas.

Currently, the location of some of the existing roads is not appropriate for ongoing management activities. The desired condition from the forest plan is to provide a safe, efficient road system (goal 3.1 on p. 1-7). The TAP showed a need to provide long-term access in parts of the project area that are not adequately accessible for long-term management of forest roads. It also showed a need for road improvements to improve or maintain access that provides for public safety, and enjoyment, while minimizing adverse environmental effects. To address this need project activities could include construction, reconstruction, closing, and decommissioning of roads.

1.3 Original Proposed Action

Based on the opportunities and needs in the Purpose and Need Section (see section 1.2.1), the District proposes the following in the project area (see Appendix C). The need for each activity is in parentheses after the action. Project acreages are approximate.

This alternative proposes to harvest (for definitions on harvest types see the glossary) 11,707 acres of timber to manage species age diversity, species composition, and improve growing conditions including:

- Thin 5,592 acres of pine, spruce, oak, northern hardwoods, and aspen (see needs 2 and 5)
- Shelterwood harvest 4,282 acres of pine, fir, birch, oak, northern hardwoods, and aspen (see needs 1 and 2)
- Clearcut 1,246 acres of jack pine, red pine, and aspen (see need 2)
- Special cut 393 acres of pine, aspen, and northern hardwoods (see needs 6 and 8)
- Selection harvest of 194 acres of northern hardwoods (see need 5A)

Other vegetation management:

- Understory plant 2,045 acres (see needs 1, 3, 4, 6, and 7)
- Understory burn 2,527 acres including composition, species diversity, communities of concern, wildlife habitat, and WUI (see needs 1, 4, 6, 7 and 8)
- Reducing hazardous fuels on 6,663 acres (includes the understory burn acres above) in the wildland/ urban interface (see need 8)
- Salmon blade treatments 97 acres (see needs 2 and 4)
- Precommercial thin 48 acres (see needs 1 and 8)
- Release seedlings in 903 acres (see needs 2 and 4)
- Full plant 510 acres (see needs 1 and 2)
- Reestablish components and processes in the Pine Barrens-burn up to 800 acres (see need 6B).
- Restore components and processes of Northern Dry Forest, included as part of the timber harvest above (see need 6A)
- Management of 217 acres of wildlife openings (see need 7A)
- Protect and create habitat for wood turtle with design features (see need 7C)
- Improve habitat for red-shoulder hawk, and goshawk with timber management activities by underplanting with white pine and hemlock, which provide nesting material and prey habitat (see need 7B).
- Biomass removal of 1,597 acres (biomass is the result of the harvest activities above)

Access management of roads (see need 9):

- Construct 2.1 miles of road, which would be closed after use
- Reconstruction/maintenance of 32.8 miles of road
- Create parking areas and install barriers on the ground to block closed/decommissioned roads, which are not open to public motorized use from prior decisions, within the project area
- Decommission 23.4 miles of open unauthorized roads outside of the non-motorized area
- Decommission 3.1 miles of open system road and remove them from the Motorized Visitor Use Map outside the non-motorized area
- Close 3.9 miles of road outside the non-motorized area

To better address wildlife and public concerns, all roads would be built to the lowest possible road standard to meet management objectives and reduce resource impacts. Closing or decommissioning roads would further address concerns associated with roads.

1.4 Decision Framework

The District Ranger of the Lakewood-Laona Ranger District is the responsible official for making project level decisions for the project. Based upon the effects of the alternatives, the responsible official would decide what level of activity is necessary to address the forest plan and issues associated with this project. This level of activity could be one alternative, parts of alternative(s), or no decision at all.

The decision to be made is whether to implement the proposed action, an alternative action, no action, or a combination or parts of different alternatives. This project would not require a forest plan amendment under any alternatives.

1.5 Public Involvement

This section explains the public involvement used so far in this project (see the project record, volume 2). On March 31, 2011, the District sent scoping letters to tribes, other agencies, and members of the public who own property in that area or who have expressed an interest in the project. This project has appeared on the forest's quarterly "Schedule of Proposed Actions (SOPA)" since October of 2010. The CNNF mails the SOPA to all parties who have asked to be informed of proposed projects and the SOPA is available on the CNNF's website. The Federal Register published a Notice of Intent (NOI) to prepare an EIS on April 7, 2011. The NOI requested public comments on the proposal during the period of April 8 to May 9, 2011.

The draft EIS was sent out to self-subscribers and commenters from the scoping on October 11, 2012. It was published in the Federal Register on October 19, 2012. Because of the public involvement described above, the District received 70 responses from individuals or organizations providing comments and concerns. Comments received were reviewed and considered by the interdisciplinary team (IDT). Using the comments from the above public

involvement, the IDT developed a list of issues to address (see project record, volume 4A). This EIS discusses issues in the following section.

1.6 Issues

Public comments can create key issues, issues, and create or modify alternatives as part of this project's process. The following is a summary of this how this process transpired for this project.

The Council for Environmental Quality (CEQ) NEPA regulations require delineation of issues in Sec. 1501.7, "…identify, and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" The following paragraphs discuss the comment grouping process.

On May 17 and 18, 2011, and again on December 11, 2012 an interdisciplinary team met to review the results of public involvement and separated the comments into groups: issues and key issues. The IDT evaluated a number of comments and found them to be issues (appendix E)–not key issues. These were not considered key issues because they: 1) did not identify a specific impact related to the proposed action, 2) did not suggest an alternative to the proposed action, 3) the concern was already addressed by another analysis or document (such as forest plan decisions), or 4) the issue was addressed by law or regulation. These were not analyzed in detail. The responsible official reviewed this evaluation in order to determine which responses contained issues.

The IDT reviewed the comments and identified the ones that had a cause and effect relationship to the projects actions. These issues also had to be relevant to the proposed action to become "key issues"; they were then analyzed in detail. The IDT defined the key issues relationships to the proposal and recommended them for approval to the responsible official. The responsible official approved the key issues and the range of alternatives to analyze in detail (see project file, volume 4, section B, Issue chart).

The IDT used key issues to disclose and compare differences in the alternatives. The IDT defined key issues as those directly or indirectly caused by implementing the proposed action. The District addressed key issues in three ways: 1) developing an alternative to alter resource tradeoffs, 2) requiring design features to reduce impacts to a resource, and 3) disclosing and comparing the relative difference in resource effects between alternatives and to acceptable thresholds. Addressing a key issue may use one or more of these methods or resource.

The following section is the list of key issues as determined from review by the responsible official. For each key issue, we describe how it relates to the proposed action (cause/effect), how it would be measured (indicators of resource impacts), and how it would be addressed in this assessment. Key issues are not a restatement of the project objectives (resource benefits defined by the purpose and need), but express resource tradeoffs that may result from the actions used to attain the project objectives. How each alternative attains project objectives is measured and

compared in this assessment alongside the issues to disclose the full effects of actions (EIS chapter 3 and specialist reports).

1.6.1 Key Issues used to develop alternatives from public scoping

The IDT identified four key issues, listed below. This section explains for each key issue: what the key issue is, what the cause and effect it has, measures used to show effect, how the IDT would address it in the process, and the effect threshold. All key issues are from external scoping and are paraphrased from public comments, unless in quotes; there are no internal key issues.

A. Aspen Management

A1. The key issue is the loss of early successional forest/young aspen.

The proposed action would cause a net decrease in the early successional habitat/young aspen. The project's proposed clearcutting of 815 acres is beneficial to early successional species, but the conversion of over twice that amount of aspen (1,796 acres) to other forest types would cause a decrease in early successional habitat/young aspen.

Measure

- Aspen composition measured as a percentage of upland and in total acres.
- Aspen age class measured as a percentage in each class.
- Habitat change effects on early successional species

Measure in terms of

The terms of the measure are magnitude, extent, duration, likelihood, and speed. The magnitude value is the percent of composition and age class and the extent of the span of influence is the project area. The duration is the entry period; the likelihood of the value becoming a reality would be high (90 percent) during/after implementation, if implemented, or zero percent for no implementation; the speed to reach the desired value would be a couple of years to complete implementation, if implemented.

Addressed By

The IDT developed the Early Successional Habitat Alternative (3) to increase early successional forest. This would increase clearcutting from 1,246 to 2,021acres. This alternative has extensive regeneration harvest to prevent conversion. This issue is addressed in the Forest Vegetation Resource Report, section 3.2, MIS/MIH report, section 3.6, and the Early Successional Alternative (3) in chapter 2.2.3.

Threshold

The forest plan objective (p. 3-10) is for aspen to remain between zero to 30 percent of the upland forest type composition depending on the MA, and to have 15 to 25 percent of all aspen on the forest within the youngest age class of zero to 10 years (p. 2-5). There is no threshold established for MIS/MIH.

A2. The key issue is a loss of mature aspen, which is habitat for forest raptors.

The proposed action, which clearcuts 736 acres of older aspen, would create young forest. Increasing early successional habitat could reduce nesting habitat opportunities for goshawks that may nest in mature aspen stands.

Measure

- Aspen age class measured as a percentage in each class.

Measure in terms of

The terms of the measure are magnitude, extent, duration, likelihood, and speed. The magnitude value is the percent of composition and age class and the extent of the span of influence is the project area. The duration is the entry period; the likelihood of the value becoming a reality would be high (90 percent) during/after implementation, if implemented, or zero percent for no implementation; the speed to reach the desired value would be a couple of years to complete implementation, if implemented.

Addressed By

The IDT developed the Late Successional Habitat Alternative (4) to reduce early successional habitat; therefore, preserving more mature successional habitat. Alternative 4 thins 443 acres of aspen, a reduction in clearcuts. This issue is addressed in the Forest Vegetation Resource Report (section 3.2) and the Late Successional Habitat Alternative (4) in chapter 2.2.4.

Threshold

The forest plan guideline (p. 2-25) for older aspen (46+ years of age) is 10 percent.

B. Road Management

B1. Road construction/reconstruction effects road density

The proposed action would construct 2.1, reconstruct 32.8, close 3.9, and decommission 26.5 miles of roads. Road density within the project area exceeds the forest plan guidelines; the proposed action would reduce road density.

Measure

- Road density in square miles
- Miles of road constructed/reconstructed
- Miles of road decommissioning

Measured in terms of

The IDT would measure this issue in terms of magnitude, extent, duration, likelihood, and speed. The magnitude value is the number of miles or square miles and the extent of the span of influence is the project area. The duration is the length of this project; the likelihood of the value becoming a reality would be high (90 percent) during/after implementation, if implemented, or zero percent for no implementation; the speed to reach the desired value would be a couple of days to weeks construct or reconstruct a road.

Addressed by
The IDT developed the Late Successional Habitat Alternative (4) to address the issue of road density. This alternative has no reconstruction and less construction than Alternative 2. See the Transportation Report and section 3.3.

Threshold
The forest plan has thresholds for road density (forest plan, p. 1-7, appendix BB and the FEIS Map Set). An effect would be unacceptable if it increased open and/or total road density over the forest plan's set limit (see Transportation section 3.3).

B2. Road construction/reconstruction can have pervasive and cumulative effects on resources
Road construction and reconstruction can have pervasive and cumulative effects that increase sedimentation in waterways and the spread invasive species.

Measure
- Percentage of watershed in an open condition
- Acres of soil disturbance

Measured in terms of
The IDT would measure this issue in terms of magnitude, extent, duration, likelihood, and speed. The magnitude value is the number of miles or square miles and the extent of the span of influence is the project area. The duration is the length of this project; the likelihood of the value becoming a reality would be high (90 percent) during/after implementation, if implemented, or zero percent for no implementation; the speed to reach the desired value would be a couple of days to weeks construct or reconstruct a road.

Addressed by
Road construction/reconstruction affects different resources. This issue is addressed in the Water Resources Report (summary in section 3.9), Non-Native Invasive Species (NNIS) (see summary in section 3.7), and the Late Successional Habitat Alternative (4).

Threshold
Sedimentation- The selected thresholds were greater than 60 percent of a watershed in an open condition (forest less than 15 years old, non-forest upland, non-forest wetland) for snowmelt runoff and greater than 35 percent upland in an open condition for storm flow runoff (forest less than nine years old, non-forest upland), see Water Resource section 3.9.

NNIS- The thresholds defined for this analysis are: 1) Direct spread means there would be no spread of known infestations directly from to proposed actions, 2) Indirect Spread means there would not exceed a low risk of new introductions from to proposed actions (see NNIS section 3.7).

1.7 Other Related Efforts

Non-native invasive species (NNIS)
The purpose of this project is to protect and restore native ecosystems and rare plant populations on the forest by controlling or eliminating existing populations of non-native, invasive species of plants. It was signed in July 2005. This project provides information on NNIS used in the NNIS section 3.7 of the EIS.

CNNF Travel Management Project
The purpose of this project, which encompasses the entire CNNF, is to designate which roads and trails would be available for public motorized use, and therefore included on the MVUM. The outcome of this project is a designated network of roads and trails available for public motorized vehicle use on the CNNF. The CNNF began implementing the MVUM in January 2009 and updates it annually. This project is considered in the TAP and the Transportation section 3.3 of this EIS. It may affect the road density in the project area (Issue B).

Early Successional Habitat Improvement Project
In this project, the CNNF proposes to manage twelve of its ruffed grouse management areas (RGMAs) to improve and enhance early successional habitat. This decision was signed on March 2, 2012. This project affects the amount of early successional habitat (Issue A). Analysis of this project is included in the cumulative effects sections.

Lakewood-Laona Plantation II Thinning Project
The District would thin red pine within the project area. This project affects pine overstocking (see need 5A). Analysis of this project is included in the cumulative effects sections.

Flower Lake Stewardship Project
This project includes 23 acres of jack pine removal that would release red pine-oak and would affect the pine age class distribution (see need 2). Analysis of this project is included in the cumulative effects sections.

CHAPTER 2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Introduction

This chapter describes and compares the alternatives considered for the project. It includes a description and map (see appendix C) of each alternative considered. This chapter also presents the alternatives in comparative form (see tables at the end of the chapter), sharply defining the differences between each alternative, and providing a clear basis for choice among options by the decision maker and the public. Some of the information used in the comparison of the alternatives results from the design differences of the alternatives (e.g., even-aged regeneration

harvests vs. intermediate thinning) and some of the information is based upon the environmental, social, and economic effects of implementing each alternative. After describing each alternative, this chapter would list design features and end with charts that compare the alternatives.

Alternative Development
This chapter describes a No Action Alternative and action alternatives, which wholly or partially meet the purpose and need identified in chapter 1. Chapter 2 concludes with a comparison of the alternatives in their ability to meet the purpose and need. This chapter provides the reviewer with the tradeoffs between alternatives. IDT developed alternatives from the key issues in section 1.6.

The IDT considered the elements listed below when they developed the alternatives for this analysis:

- Key issues identified in chapter 1, section 1.6.
- The purpose and the need for this analysis identified in chapter 1.2.
- The goals, objectives, and desired conditions for the project as described in the forest plan in chapter 1.2 and 1.2.2.
- Comments made by the public, the State, and other agencies during the scoping process in chapter 1, section 1.6.
- The laws, regulations, and policies that govern land management on the National Forest in chapter 4, section 3.12.
- This includes site-specific resource information in chapters 1, 2, and 3.

The IDT developed four alternatives in response to key issues raised by the public, including the No Action (Alternative 1), Proposed Action (Alternative 2), the Early Successional Habitat (Alternative 3), and Late Successional Habitat (Alternative 4).

2.2 Alternatives Considered in Detail

All action alternatives are the same for the following actions: wildlife openings, salmon blade, precommercial thin, decommissioning of open roads and closing of roads outside the non-motorized area. The alternatives below discuss the actions that would change, such as harvest. The No Action Alternative (1) does not move toward any of these objectives.

2.2.1 No Action Alternative - Alternative 1

The Council on Environmental Quality (CEQ) regulations for implementing NEPA requires the development of the No Action Alternative to provide a baseline for estimating the effects of other alternatives. Regulations require the analysis of the No Action Alternative (1) which provides a benchmark, enabling decision makers to compare the magnitude of environmental effects of the action alternatives (40 Code of Federal Regulations {CFR} 1502.14 (d)). In addition, this alternative constitutes and is a viable alternative course of action with regard to the proposed action. This interpretation of the No Action Alternative (1) is that no new actions or activities proposed in this project would take place.

This alternative does not address all key issues. With this alternative natural and other processes would influence successional habitats/aspen, including natural conversion. It has no effects from harvesting on red-shoulder and northern goshawk habitat.

Road construction and reconstruction would follow the travel management direction for the CNNF. No road closures, decommissioning or openings would take place under this decision. Road density would remain the same, not moving toward the desired condition. There would be no impacts from road construction/reconstruction.

No new activities would take place and there would be no effects from current actions. The proposed action would not occur. Other than normal ongoing administrative, maintenance, and protection work, no actions would take place within the project area.

2.2.2 Proposed Action Alternative – Alternative 2

The Proposed Action (2) is the original alternative proposed by the agency. The IDT created this alternative to best respond to the purpose and need, and meet the desired conditions in the forest plan. The IDT developed Alternative 2 to move the area toward desired conditions from the current conditions. How this alternative addresses the key issues are discussed in the associated specialist reports in chapter 3.

This alternative proposes to harvest (for definitions on harvest types see the glossary) 11,707 acres of timber to manage species age diversity, species composition, and improve growing conditions including:

- Thin 5,592 acres of pine, spruce, oak, northern hardwoods, and aspen (see needs 2 and 5)
- Shelterwood harvest 4,282 acres of pine, fir, birch, oak, northern hardwoods, and aspen (see needs 1 and 2)
- Clearcut 1,246 acres of jack pine, red pine, and aspen (see need 2)
- Special cut 393 acres of pine, aspen, and northern hardwoods (see needs 6 and 8)
- Selection harvest of 194 acres of northern hardwoods (see need 5A)

Other vegetation management:

- Understory plant 2,045 acres (see needs 1, 3, 4, and 6B)
- Understory burn 2,527 acres including composition, species diversity, communities of concern, wildlife habitat, and WUI (see needs 1, 4, 6, 7 and 8)
- Reducing hazardous fuels on 6,663 acres (includes the understory burn acres above) in the wildland/ urban interface (see need 8)
- Salmon blade treatments 97 acres (see needs 2 and 4)
- Precommercial thin 48 acres (see needs 1 and 8)
- Release seedlings in 903 acres (see needs 2 and 4)
- Full plant 510 acres (see needs 1 and 2)
- Restore components and processes of Northern Dry Forest, included as part of the timber harvest above (see need 6A)
- Reestablish components and processes in the Pine Barrens-burn up to 800 acres (see need 6B).
- Management of 217 acres of wildlife openings (see need 7A)

- Improve habitat for red-shoulder hawk, and goshawk with timber management activities by underplanting with white pine and hemlock, which provide nesting material and prey habitat (see need 7B).
- Protect and create habitat for wood turtle with design features (see need 7C)
- Biomass removal of 1,597 acres (biomass is the result of the harvest activities above)

Access management of roads (see need 9):

- Construct 2.1 miles of road, which would be closed after use
- Reconstruction/maintenance of 32.8 miles of road
- Create parking areas and install barriers on the ground to block closed/decommissioned roads, which are not open to public motorized use from prior decisions, within the project area
- Decommission 23.4 miles of open unauthorized roads outside of the non-motorized area
- Decommission 3.1 miles of open system road and remove them from the Motorized Visitor Use Map outside the non-motorized area
- Close 3.9 miles of road outside the non-motorized area

To better address wildlife and public concerns, all roads would be built to the lowest possible road standard to meet management objectives and reduce resource impacts. Closing or decommissioning roads would further address concerns associated with roads.

2.2.3 Early Successional Habitat Alternative - Alternative 3- Agency's preferred Alternative

The loss of early successional habitat is an external key issue that was brought up in scoping. The IDT developed this alternative to address the issue of loss of early successional habitat and aspen, while still meeting the purpose and need.

Some characteristics of this alternative include the same wildlife, biomass, and fuel reduction management as Alternative 2. This alternative would increase jack pine clearcuts. The following is a list of activities that are included in this alternative :

- This alternative proposes to harvest 10,752 acres of timber to manage species age diversity, species composition, and improve growing conditions, including:
- Thin 4,249 acres of pine, spruce, oak, northern hardwoods, and aspen (see needs 1 and 5)
- Shelterwood harvest 3,894 acres of pine, fir, birch, oak, and northern hardwoods (see needs 1 and 2)
- Clearcut 2,021 acres of jack pine, red pine, and aspen (see need 2)
- Special cut 393 acres of pine, northern hardwoods, and aspen (see needs 6 and 8)
- Select harvest of 194 acres of northern hardwoods (see need 5A)

Other vegetation management:

- Understory plant 1,768 acres (see needs 1, 3, 4, 6, and 7)
- Understory burn 2,733 acres (see needs 1, 4, 6, 7, and 8) including composition, species diversity, communities of concern, wildlife habitat, and WUI (see needs 1, 4, 6, 7 and 8)

- Reducing hazardous fuels on 6,758 acres (including the understory burn acres above) in the wildland/ urban interface (see need 8)
- Salmon blade treatments 97 acres (see needs 2 and 4)
- Precommercial thin 48 acres (see needs 1 and 8)
- Release seedlings in 850 acres (see needs 2 and 4)
- Full plant 598 acres (see needs1 and 2)
- Reestablish components and processes in the dry northern forests and Pine Barrens (burn up to 1,000 acres), (see need 6 A and B)
- Management of 217 acres of wildlife openings (see need 7A)
- Improve habitat for red-shoulder hawk, and goshawk with timber management activities by underplanting with white pine and hemlock, which provide nesting material and prey habitat (see need 7B).
- Improve habitat for wood turtle with design features (see need 7C)
- Biomass removal of 1,634 acres (biomass is the result of the harvest activities above)

Access management of roads (see need 9):

- Construct 1.2 miles of road
- Reconstruction/maintenance of 30.7 miles of road
- Install barriers on the ground to block closed/decommissioned roads, which are not open to public motorized use from prior decisions, within the project area
- Decommission 23.4 miles of open roads outside of the non-motorized area.
- Decommission 3.1 miles of open system road and remove them from the MVUM outside the non-motorized area
- Close 3.9 miles of road outside the non-motorized area

2.2.4. Late Successional Habitat Alternative - Alternative 4

One external key issue (comment from Environmental Law and Policy Center [ELPC], see appendix E), from scoping was for the concern for species that require mature aspen forest. Their concern was that the species numbers have been declining. Another external key issue was the effects of road construction and reconstruction. The IDT developed this alternative to address both external key issues of the decrease in mature aspen, and effects of road construction and reconstruction. For aspen, this alternative decreases aspen treatment, and allows natural succession to occur. There is no reconstruction or biomass removal in this alternative. This alternative adds the items suggested by the commenter that were incorporated into the alternative by the IDT.

The following is a list of activities that area included in this alternative :

- This alternative would propose to harvest 6,486 acres of timber to manage species age diversity, species composition, and improve growing conditions, including:
- Thin 4,354 acres of pine, spruce, oak, northern hardwoods, and aspen (see needs 1 and 5)
- Shelterwood harvest 1,422 acres of pine, fir, birch, oak, northern hardwoods and aspen (see needs 1 and 2)
- Clearcut 374 acres of jack pine, red pine, and aspen (see need 2)
- Special cut 272 acres of jack and red pine (see needs 6 and 8)
- Select harvest of 64 acres of northern hardwoods (see need 5A)

Other vegetation management:

- Understory plant 948 acres (see needs 1, 3, 4, 6, and 7)
- Understory burn 2,039 acres (see needs 1, 4, 6, 7, and 8) including composition, species diversity, communities of concern, wildlife habitat, and WUI (see needs 1, 4, 6, 7 and 8)
- Reducing hazardous fuels on 5,896 (including the understory burn acres above) acres in the wildland/ urban interface (see need 8)
- Salmon blade treatments 97 acres (see need 2 and 4)
- Precommercial thin 48 acres (see needs 1 and 8)
- Release seedling in 519 acres of timber stands (see needs 2 and 4)
- Full plant 339 acres (see needs 1 and 2)
- Reestablish components and processes in the dry northern forests and Pine Barrens (burn up to 300 acres), (see need 6A and B)
- Management of 217 acres of wildlife openings (see need 7A)
- Improve habitat for red-shoulder hawk, and goshawk with timber management activities by underplanting with white pine and hemlock, which provide nesting material and prey habitat (see need 7B).
- Improve habitat for wood turtle (see need 7C)

Access management of roads (see need 9):

- Construct 1.8 miles of road
- No road reconstruction
- Install barriers on the ground to block closed/decommissioned roads, which are not open to public motorized use from prior decisions, within the Lakewood Southeast Project Area.
- Decommission 23.4 miles of open unauthorized roads outside of the non-motorized area.
- Decommission 3.1 miles of open system road and remove them from the MVUM outside the non-motorized area.
- Close 3.9 miles of road outside the non-motorized area.

The following items were requested by ELPC and included by the IDT in this alternative:

- Defer all proposed clearcuts or shelterwood harvests in white or red pine stands over 80 years of age
  Defer logging of any kind in red or white pine stands over 100 years old
- Defer all proposed logging in hardwood stands over 80 years of age
- Increase the number of large trees retained in cutting units
- Increase the size and number of large downed woody debris in cutting units, particularly near riparian zones and wetlands
- Incorporate timber harvest prescriptions that do not result in increases in soil temperature in cutting units
- Eliminate proposed logging within 30 meters of any stream, lake, or other water body in the project area, except to facilitate succession to longer-lived species
- Defer all logging within 500 meters of historic or current northern goshawk or red-shouldered hawk nest sites, if any

- Ensure that all logging activities for this project fully adhere to forest plan guidelines. Those guidelines are important for the protection and continued viability of RFSS such as the red-shouldered hawk and northern goshawk (is not an RFSS).

The following were requests that were not included:

- Eliminate all proposed even-aged treatments within 400 meters of Canada Yew, if any, and yellow birch sites to reduce amounts of new forage for white-tailed deer. This was not included because there are no known Canada Yew or yellow birch sites in the project area.
- Close and decommission additional roads in the project area. There was no additional decommissioning/closure opportunities were practicable with long-term access objectives.
- Incorporate prescriptions that do not increase soil temperatures. Since all harvest treatments have the potential to affect soil temperatures, it was not feasible to include this feature.

2.3 Design Features

Responding to concerns about potential resource impacts, the IDT developed the following design features used as part of the action alternatives. Some of these measures, such as timing restrictions to protect rare and endangered species or buffer areas to protect heritage resources, would only be implemented in specific areas where the District has identified a known presence. To protect the locations of rare and endangered species and heritage sites, design features specific to them would not be included in appendix A. Some features are project wide and others are stand specific, see appendix A. All forest plan's standards and guidelines are included design features in this project and are listed in appendix D.

2.3.1 Forest plan's highlighted design features

A. Cultural resources protection requirements

Proposed activities (including yarding, hauling, slash disposal, and temporary road construction) in stands near recorded heritage resources would remain an appropriate minimum distance (no less than 60 feet) from a line established by the Forest Archeologist, (or designee of the Forest Archeologist). Utilize applicable contract clauses to insure protection occurs throughout harvest implementation.

If the implementer discovers heritage resources during this project, all activities within the vicinity of the discovery area would cease until a professional archaeologist has made an on-site assessment of the discovery (p. 2-29).

B. Soils protection requirements

Soil Resource Design Features Applicable to all Treatment Areas

B1. Designate the location of roads, trails, landings, main skid trails, and similar soil disturbing activities. Stabilize disturbed sites during use and revegetate after use to control erosion (p. 2-3).

B2. Minimize road impacts by utilizing soil protection measures described in "Wisconsin's Forestry Best Management Practices" and "Wisconsin's Construction Site Best Management Practices Handbook" (p. 2-38).

B3. Decommission all temporary roads upon completion of authorized use (p. 2-36).

Stand specific design features
B4. Operate heavy equipment only when soils are not saturated or when the ground is frozen (p. 2-3). Follow recommended operating season from the soil design features spreadsheet.

B5. Retain logging slash in place (limbing at the stump) where topsoil is less than 1 inch thick, or where organic matter is less than two percent (Guideline, p. 2-3). This guideline is compliant with the "Do not harvest woody materials on dry nutrient-poor sandy soils" from the Wisconsin Forestland Woody Biomass Harvesting Guidelines.

B6. Fine woody debris (FWD) retained on site following harvest is a combination of pre-existing down FWD, incidental breakage during harvest operations, and tops and limbs (less than four inch diameter) from 10 percent of the trees in the general harvest area (e.g. one average-sized tree out of every 10 trees harvested). This applies to whole tree biomass removal only.

C. Wildlife protection requirements
T&E and RFSS Requirements
C1. Protect active and historic goshawks and red-shoulder hawk nest sites: within an area of at least 30 acres surrounding any nest site, land use activities would be limited to those that do not reduce canopy closure or are necessary to protect the nest site for as long as the territory or stand is suitable habitat. No timber harvest would occur within the 30-acre buffer area. Minimize human disturbance within the buffer from February 15 - August 1. Within 330 feet of the designated buffer, no even-aged management would be used (p. 2-20 and 2-21).

C2. In stands that are within 300 meters from streams with known occurrences of wood turtles and are suitable summer habitat for the turtles, site-disturbing activities will only occur between Oct. 1 and April 30. During this time, wood turtles would be hibernating in streams and would eliminate any chance of killing or injuring turtles with the harvest equipment. This would protect the one wood turtle communal nesting site and the other smaller or individual nesting areas within the project (p. 2-22 and 2-23).

C3. If wolf dens and rendezvous sites were located, the sites would be protected through the implementation of the forest plan's standards and guidelines (p. 2-19).

Wildlife Trees
C4. Reserve all dead snags and live den trees up to 10 trees/snags per acre, unless they present a safety concern. Emphasize the largest snags and den trees available. Those snags felled for safety reasons would be left on site as coarse woody debris wherever possible. If additional snags would be required they would recruited from live reserve trees.

Also, reserve two to five live trees per acre greater than 11 inches in diameter (consistent with Timber Harvest Reserve Areas and Reserve Tree guidelines (p. 2-14)). If not possible, select the largest trees available; and reserve variable size reserve islands/clumps that total up to ½ acre for every 10 acres managed with an even aged harvest. Focus on the largest trees.

C5. Where available, emphasize maintenance of large beech for wildlife use (p. 2-14).

These design features are not from the forest plan, but would be applied as needed for bats.
C6. Emphasize diversity, cover and (or) mast by reserving tree species such as hemlock, northern white cedar, white pine, red oak, American beech, hickory, ironwood, blue beech, yellow birch, paper birch, and other species that may not have strong local or forest wide representation.

Reserve the above-listed tree species in small clumps or islands of trees within clearcuts, overstory removal cuts, and other regeneration harvest areas.

Retain long-lived conifers and hardwoods as reserve trees within aspen clearcuts. Where long-lived trees are not present- retain short-lived conifers if they are available.

Develop and retain trees over 24 inches in diameter to increase the probability of natural gap formation and tip-up mounds. The number of reserve trees over 24 inches in diameter would be included within the 4-9 reserve live tree total. Large (over 24 inches) basswood, ash, yellow birch, and red oak are preferred for retention.

D. Cold water fisheries and water quality protection requirements
D1. Aspen patches would not be regenerated within 450 feet of Waupee Creek (includes Waupee Creek below McCauley Creek), Little Waupee Creek, Hines Creek, Baldwin Creek, and Bonita Creek (p. 2-17, appendix DD). Manage vegetation within these buffer zones for species other than aspen, preferably long-lived conifer and northern hardwoods.

D2. Aspen patches would not be regenerated within 300 feet of Forbes Creek, Hay Creek, McCauley Creek, Waupee Creek (from McCauley Creek to Waupee Flowage), and North Branch Oconto (p. 2-17). Manage vegetation within these buffer zones for species other than aspen, preferably long-lived conifer and northern hardwoods.

D3. Apply standard Best Management Practices (BMPs) for riparian management zones in accordance with the updated 2010 Wisconsin's Forestry Best Management Practices for Water Quality (p. 2-2). 100' riparian management zone (RMZ) on 3' wide and wider streams and on designated trout streams (of any width), 35' RMZ on streams less than 3' wide and 35' RMZ on less than one foot wide streams. For the 100' RMZ, from the ordinary high water mark to 15' is a "no equipment zone" and from 15 'to 50' is a "dry or frozen ground equipment zone." For the 35' RMZ, operate wheeled or tracked equipment within 15' of the ordinary high water mark only when the ground is frozen or dry. Exclude any wide alder and grass floodplain along streams from treatment. This would protect these floodplains and further separate the streams from areas of operation, thereby providing extra protection.

D4. All stands: Design and maintain roads and trails in riparian areas or other locations that could affect water quality, in accordance with Wisconsin's Forestry BMPs. Stabilize road and trail surfaces within these areas with aggregate or other suitable material during non-frozen conditions (p. 2-2). Avoid wetlands, if possible and reduce the number of road and trail crossings, as well as, sedimentation. Also, improve fish passage by road and trail design.

D5. All stands: Do not dispose of or move upland slash into a wetland or open water. Operate equipment in the wetland filter strip only when the ground is firm or frozen. A wetland filter strip begins at the edge of the wetland and extends a minimum 15' away from wetland. Whenever practical, avoid locating roads and landings in the wetland filter strip. Minimize soil exposure and compaction to protect ground vegetation and the duff layer in the wetland filter strip. Utilize guidelines found in Wisconsin's Best Management Practices (BMPs) to maintain hydrologic wetland functions (p. 2-2).

D6. All stands: Maintain a minimum of 80 percent shrub or tree shade (where present) around ground water seeps within cool and cold water systems (p. 2-16).

D7. Apply standard BMPs for mechanical site preparation, tree planting, and prescribed burning in accordance with the updated 2010 Wisconsin's BMPs for Water Quality (p. 2-2).

D8. All stands: Protect warm and cold-water streams from sedimentation by maintaining the physical integrity of intermittent and non-navigable streams, i.e., streams that do not appear on 1:24,000 topographic maps to ensure their continued function when they do contain water (p. 2-2).

D9. Manage riparian areas so that they contribute large woody debris (LWD) to lakes, ponds, rivers, and streams. LWD characteristics include:
(1) At least 10-30 pieces per 1,000 feet of shoreline adjacent to uplands, and at least 5 to 20 pieces per 1,000 feet of shoreline adjacent to forested lowlands;
(2) Most pieces greater than 12 inches in diameter and some resistant to decay;
(3) Many pieces in lakes with strong branches on the boles, which hold part of the wood off the bottom;
(4) LWD length should be at least 50 to 120 feet long in lakes and wide streams, or a length that is one to two times bank full width in narrow-medium width streams (i.e. less than 50' wide) (p. 2-16).

D10. All appropriate permits needed from the Army Corps of Engineers and Wisconsin Department of Natural Resources would be obtained prior to construction activities when needed. This may include Clean Water Act National Pollutant Discharge Elimination System (NPDES) permit for storm water discharge.

E. Control of NNIS establishment and spread (All stands as needed)
E1. Include Equipment Cleaning provision in all timber contracts: Clean off-road equipment used for timber harvest or road construction or decommissioning prior to use on National Forest land unless evidence is provided the off-road equipment last operated in a non-native invasive plant (NNIS) free area. Clean equipment used in sites already documented as infested prior to leaving the contaminated sites, unless movement is into another work area already infested with the same invasive plant species. Such equipment would have all mud and plant parts removed. To best comply with this, begin operations in un-infested areas before operating in NNIS infested areas. Sales administrator, harvest inspector, contracting official, or other designated officials would conduct monitoring of equipment cleaning throughout the duration of ground

disturbing activity. The timber sale contracting officer would approve equipment cleaning sites on CNNF after consulting with the District plant ecologist (p. 2-25).

E2. Insure that fill material sources (sand and gravel pits) do not contain non-native invasive plant species (p. 2-38). If NNIS free fill and gravel sources are not available, scrape the top layer off the fill/gravel source and use the fill/gravel underneath. This would reduce the amount of NNIS plants and seed transported with the gravel.

E3. Locate and use weed-free staging areas (p. 2-25). Identify and avoid known NNIS areas on the ground by flagging or other means. Heavy equipment operation would avoid travel through NNIS areas. Flag these areas as a no-harvest zone, or design as reserve areas in the harvest layout. Exceptions may be made on a case-by-case basis for infestations such as those on the edges of roads used as primary travel routes. The zone ecologist, District biologist, or biological technician would evaluate exceptions. Report undocumented locations of NNIS areas not identified during the analyses of this project to zone ecologist for future treatment.

E4. Minimize soil disturbance to the extent practical, consistent with the project's objectives (p. 2-25). Revegetate disturbed soil in a manner that optimizes native plant establishment. Use native seed or annual grass seed (such as winter wheat or oats) for revegetation. This would stabilize the soil, discourage invasive species from establishing, and still allow the native species to re-colonize the disturbed area after the first year.

F. Regional forester sensitive species (RFSS) protection requirements

F1. Vegetation management within 100 to 500 feet of RFSS plant and animal sites will be limited to practices that maintain or enhance habitat and micro-habitat conditions. Animal sites are defined as active nest, active den, or evidence of breeding activity (p. 2-20).

F2. Retain butternut trees with more than 70 percent live crown. Retain when cankers affect less than 20 percent of the combined circumference of the bole and root flares. Retain butternut trees that have no cankers and at least 50 percent live crown. Dead and poor vigor butternut trees may be harvested (p. 2-6).

G. Scenic integrity objective (SIO) protection requirements

G1. For high scenic integrity objective roads with speeds 55 MPH and over: temporary openings should be no more than 130 feet long (along the road), should be separated by a minimum distance of 500 feet (use design features such as reserve islands, leave strips, and other measures to reduce visual impacts). The openings should occupy no more than 400 feet of each mile of road (p. 2-30). These include State Highway 32 and 64; also County Highway W.

G2. Within high SIO areas, reduce slash below 2 feet within 150 feet of non-motorized and 100 feet for motorized travel ways, use areas, and water bodies. Also, remove slash within 10 feet of these areas. Also included are all lakes 10 acres in size or larger (Sunrise, Waupee Flowage, Grindle, Green Lake, Ledge Lakes, and Chute Pond), the North Branch Oconto River, and all developed campgrounds (NA), picnic (Green Lake), and day use areas (Waupee and Bear Paw boat landings). Follow the guidelines in the forest plan p. 2-29 to 2-33.

G3. Guidelines for stands within proposed within Moderate SIO areas (p. 2-30 to 2-33) are as follows: allow no more than a 300-foot distance of temporary opening along roads and trails. Separate openings by a minimum distance of 500 feet and would occupy no more than 1,056 feet of each mile of road or trail. These include forest roads (FRs) 2071, 2072, 2102, 2104, 2303, 2306, 2308, 2309, 2319, 2630, and Grindle Lane.

G4. Locate temporary openings at least 100 feet from the perimeter or edge of recreation use areas, such as campgrounds, trailheads, and canoeable rivers (p. 2-30). Also, non-motorized trails (except hunter walking trails), all developed sites, remote campsites on lakes and canoeable rivers; and all canoeable rivers not included in high SIOs are included as moderate SIOs (p. 2-30). These include Bagley Rapids Campground, boat landings, Green Lake Picnic area, and remote campsites at Waupee Flowage and Bear Paw Lake.

2.3.2 Non-forest plan design features

Features Specific to this Action: The following features are not forest plan requirements, or other agency direction, but are being required in the proposed action to address specific concerns that surfaced in public involvement.

H. **ATV Safety**

Keep logging debris off the ATV trail/route concurrently with logging operations. Debris shall be removed a minimum of 10 feet from the trails edge. Unless otherwise agreed upon, prohibit hauling on the trail on weekends and holidays (Friday noon to midnight Sunday) from May 1st to October 31st.

Where simultaneous trail/road use by ATV riders and logging trucks cannot be avoided, the trail/road shall be posted with caution signs. Remind timber sale operators of the dual use on the trail/road. If necessary, close the section of trail affected and if possible, have a temporary detour to bypass the area.

Skidding down or across the trail would be minimized. Generally skidding would cross the trail at right angles at designated locations. Repair the trail daily during active logging operations of any rutting or other ground disturbance that would pose a safety hazard to trail users.

Prohibit the decking of logs along inside curves of ATV trails, where they obscure visibility for ATVers. This would increase ATV safety in logging areas.

I. Insect and disease

I1. To prevent the spread of oak wilt, limit harvesting or pruning in the red oak group to the period of September 1 - April 1.

I2. To prevent the introduction and/or spread of Annosum root rot, borax-based products, such as Sporax® or Cellu-Treat® would be applied (in accordance with Special Provision R9-CT6.41#) to all conifer stumps within 24 hours of harvest unless waved in writing. This applies to conifer plantations only.

J. Snowmobile safety

J1. Timber hauling would occur on some portions of the snowmobile trails. Harvest operations could change the traditional use of the trail for snowmobiling on a temporary basis. Place restrictions on harvest operations that would prohibit timber hauling from Friday noon until Sunday at midnight and no hauling between Christmas Day and New Year's Day to reduce dual use of the trails during heavy snowmobile use periods. Post trails with logging truck caution signs where simultaneous trail/road use by snowmobiles and logging trucks cannot be avoided. This would be included in the timber sale contract and ensured during implementation by the Timber Sale Administrator.

J2. To protect snow conditions and maintain sufficient shade along snowmobile trails, some trees would be retained on the south and west sides of specified stands (see appendix A) for a distance of at least one tree length from the trails.

Minimize simultaneous (unsafe) use of snowmobile trails by snowmobiles and logging trucks. Where possible, emphasize harvesting and hauling during snow-free periods when soil conditions are not wet or temporarily reroute the trail or logging road. Remove slash and debris from the trail clearing (10 feet from the edge of the trail) as timber sale operations precede.

Prohibit the decking of logs along inside curves of snowmobile trails, where they obscure visibility for snowmobilers. Maintain satisfactory trail conditions by requiring timber sale operators to retain at least four inches of packed snow on the trail surface when plowing snow for logging truck use.

K. Vehicle safety

K1. To allow for better visibility and safety during harvest operations, construct 100-200 foot temporary landings at specified locations along town roads.

K2. Timber sale operator would post signs alerting recreationists of logging activities. This would be included in the timber sale contract and ensured during implementation by the Timber Sale Administrator.

L. Forested wetland protection

On north and east sides of specified upland stands (appendix A), where possible, maintain at least 90 ft^2/acre of basal area within 66 feet of adjacent conifer lowlands to prevent moisture shock to wetland plants. Do this during sale layout and design.

M. Public safety

Skid whole tree and pile tops at the landing for chipping and removal or burning to reduce the risk of wildland fire to lives and property (Airport Road Area).

N. Other

Slash Disposal Zone – slash would be removed for a distance of 10 feet from the base of all residual merchantable trees.

2.3.3 Monitoring features

Monitor proposed treatment areas during project implementation to ensure following of contract specifications and design features. IDT monitors selected treatment areas to evaluate whether ground conditions meet acceptable limits of change for measurable and observable soil properties. Monitor randomly selected treatment areas post-harvest by the forest soil scientist as part of a forest-wide soil-monitoring program, to evaluate whether ground conditions meet acceptable limits of change for measurable and observable soil properties. Conduct periodic timber sale implementation and effectiveness reviews, including effects to soils, across the CNNF by interdisciplinary teams on randomly selected completed harvest units.

2.4 Comparison of Alternatives

The following tables provide a concise summary of the effects that would result from the implementation of each alternative. These comparison charts do not show activities that are the same for all alternatives (see section 2.2).

Table 2.4.1: Comparison of the amount of activities and issues by alternative

Major activities from chapter 2, sections 3.2 and 3.3	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**
Total acres harvested	0	11,707	10,751	6,486
Acres selection harvest	0	194	194	64
Acres thinning	0	5,592	4,249	4,354
*Acres clear cut	0	1,246	2,021	374
Acres of shelterwood	0	4,282	3,894	1,422
Acres special cut	0	393	393	272
*Acres of aspen change, short-term	0	-900	-78	-139
Acres of aspen change, long-term	-1,400	-1,800	-786	-1,772
Acres of stand improvement	0	903	850	519
Acres under plant	0	2,045	1,768	948
Acres of full plant	0	510	598	339
Acres under story burn	0	2,527	2,733	2,039
*Miles of road construction	0	2.1	1.2	1.8
*Miles existing road reconstructed	0	32.8	30.7	0
*Decommissioned open unauthorized	0	23.4	23.4	23.4

* Issue related.

Table 2.4.2: Aspen age class distribution by alternative in the short-term- section 3.2.2

Age Class %	DFC	Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4
0-10 years	20	2	2	14	20	2
11-20 years	20	12	4	4	4	4
21-45 years	50	52	58	62	57	58
46+ years	10	35	36	19	19	35

Table 2.4.3: How each alternative meets the project purpose and need section* (section 1.2)

Purpose (Objectives)	Desired condition	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Reference - EIS section #
Forest age and composition modification						
Need 1A, Composition for MA 2C-Aspen	15-30 %	57% short-term	52% short-term	57.5% short-term	57.5% short-term	section 3.2.2
Need 1A, Composition for MA 2C-Northern Hardwoods	30-50%	8.4% short-term	13.9% short-term	8.4% short-term	8.4% short-term	section 3.2.2
Need 1D, Composition for MA 4B-Aspen	0-7%	22.8% short-term	20.2% short-term	26.9% short-term	26.6% short-term	section 3.2.2
Need 1D, Composition for MA 4B-Jack pine	3-6%	8% short-term	6.4% short-term	6.4% short-term	6.8% short-term	section 3.2.2
Need 1D, Composition for MA 4B-red/white pine	45-70%	34.4% short-term	37.7% short-term	35.9% short-term	35.5% short-term	section 3.2.2
Need 2A, age class-Aspen 0-10, short-term	20%	2%	14%	0%	2%	section 3.2.2
Need 2A, age class-Aspen 21-45, short-term	50%	58%	62%	0%	58%	section 3.2.2
Need 2A, age class-Aspen 46+, short-term	10%	36%	19%	0%	35%	section 3.2.2
Need 2C, age class-N. Hardwoods 0-20, short-term	16%	2%	2%	2%	2%	section 3.2.2

Need 2C, age class-N. Hardwoods 21-60, short-term	32%	9%	16%	9%	11%	section 3.2.2
Need 2C, age class-N. Hardwoods 61-100, short-term	32%	83%	76%	82%	80%	section 3.2.2
Need 2C, age class-N. Hardwoods 100+, short-term	20%	7%	6%	7%	7%	section 3.2.2
Need 2D, age class-jack pine 0-10, short-term	16%	6%	18%	15%	11%	section 3.2.2
Need 2D, age class-jack pine 11-30, short-term	32%	59%	64%	64%	67%	section 3.2.2
Need 2D, age class-jack pine 31-50, short-term	32%	13%	15%	17%	14%	section 3.2.2
Need 2E, age class-red pine 0-20, short-term	15%	1%	4%	7%	4%	section 3.2.2
Need 2E, age class-red pine 21-60, short-term	30%	44%	42%	42%	43%	section 3.2.2
Need 2E, age class-red pine 61-100, short-term	30%	54%	50%	50%	51%	section 3.2.2
Need 2E, age class-red pine 100+, short-term	25%	2%	2%	2%	2%	section 3.2.2
Need 2F, age class-white pine 0-20, short-term	12%	6%	5%	6%	6%	section 3.2.2
Need 2F, age class-white pine 21-60, short-term	24%	9%	11%	9%	9%	section 3.2.2
Need 2F, age class-white pine 61-100, short-term	36%	82%	80%	81%	81%	section 3.2.2
Need 2H, age class-N. red oak 20-59, short-term	38%	5%	11%	10%	11%	section 3.2.2

Need 2H, age class-N. red oak 80+, short-term	24%	85%	74%	75%	75%	section 3.2.2
Other vegetation management- see Section 4.2.1						
Need 3-Stream buffers in acres (no aspen regeneration zones)	Acres improved	0	232	29	89	section 3.2.2
Need 5A-Stocking uneven aged hardwoods in acres	Reduce 194 acres stocking	0	194	194	64	section 3.2.2
Need 5B-Stocking mixed hardwoods in acres	Reduce 179 acres stocking	0	179	179	118	section 3.2.2
Need 5C-Stocking red pine in acres	Reduce 3,932 acres	0	3, 712	3,550	3,474	section 3.2.2
Need 5D-Stocking white pine in acres	Reduce 314 acres	0	314	372	280	section 3.2.2
Need 6A-Dry northern forest in acres	Acres restored	0	6,185	5,736	5,254	section 3.2.2
Need 6B-Pine Barrens in acres	Acres restored	0	800	1,000	300	section 3.2.2
Other activities						
Need 8-Reduce hazardous fuels in WUI (includes other needs in total)	Increased acres of fuel reduction	0	6,663	6,758	5,896	section 3.4
Need 9- Reduce road density, Total RN in mi/sq. mi	Less than or equal to 4	5.2	3.9	3.9	3.9	section 3.3

*Needs that are the same in all alternatives or ones with no quantity measure are not shown above.

CHAPTER 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

In this chapter, each resource section would explain the analysis boundary used and the current condition of the resource within that boundary. This chapter also discusses the physical,

biological, social, and economic environments of the affected project area and the potential changes to those environments due to the implementation of the alternatives. It also presents the scientific and analytical basis for the comparison of alternatives.

Impacts to the environment
Impacts are composed of three parts: direct, indirect, and cumulative effects. Direct effects occur at the same time and place. Indirect effects occur later in time or further removed in distance. Cumulative effects are a result from the incremental impact of the action when added to other past, present, and future actions.

3.2 Forest Vegetation Resource

Introduction
This section is a summary of the Forest Vegetation Resource Report and summarizes the analysis and discussion related to the project's effects on forest vegetation. This section addresses key Issue A1 and A2 (aspen age class). In addition, this section discusses what effects the proposals would have on the upland vegetation within the project area now and in the future, specifically the effects on forest composition and structure. The effects section discusses how well the alternatives would restore components and processes in plant communities of concern. It then compares the anticipated changes in vegetation to the desired conditions given in the forest plan.

Measures
The primary measure would be acres of forest types and age classes. This analysis calculated the types of forest composition and age class using spreadsheets and compared them to desired conditions. Effects are measured in short-term and long-term.

Short-term effects will be defined as those that take place immediately following the implementation of the alternative in question and last for about five years. In reality, the actions included in each of the action alternatives will likely occur over a five-year period. For simplicity and for consistent analysis of the alternatives, the actions were assumed to take place in a single year- 2013. These short-term effects will also be displayed in tables under the discussion of each alternative.

Long-term effects will be defined as those that would be foreseeable about 15 years from the time of implementation of a given alternative. Since the treatments were assumed to take place in 2013, the year of long-term effects, for the sake of this analysis, is 2028.

Thresholds
A threshold is a point where, if exceeded, action or inaction would result in a significant impact to the human environment or natural resources. For vegetation composition/structure and aspen management, there are no thresholds per se. However, the forest plan (p. 2-5 and p. 3-10) has guidelines and objectives for age class distribution, density, and stand structure.

3.2.1 Affected Environment

The analysis boundary for this section includes those CNNF system lands that fall within the Lakewood Southeast Project Area. For current vegetation, conditions see chapter 1, section 1.2.

3.2.2 All alternatives direct and indirect effects of environmental consequences

Timber harvests, planting, prescribed burning, salmon blade treatment, and timber stand improvement are the key actions that would result in measurable effects to forest vegetation. All of these actions are considered and the results discussed in the context of the forest plan desired future conditions. Also considered are previous, other current and planned future activities, and their potential impacts of management to determine cumulative impacts.

Species composition

Aspen composition

In terms of moving aspen composition toward desired conditions, Alternative 2 would be the most effective in both the short and long-term. Alternative 4 would be the second most effective alternative in both the short and long-term. Alternative 1 would be the third most effective overall. Alternative 3, which attempts to maintain as much aspen as possible, is the least effective for MA 4B (see Table 3.2.2.1).

In terms of responding to the concern about the loss of aspen (Issue A), Alternative 3 would be the most effective, creating the most habitat. Alternative 1 would be the second best choice in responding to this concern. Alternative 4 would be the third best and Alternative 2 would be the least responsive alternative in terms of aspen maintenance.

For creating early successional habitat, Alternative 3 would be the best, followed by Alternative 2, then Alternative 4, and lastly Alternative 1.

Table 3.2.2.1: Effects on aspen composition

MA	Exist-ing Acres	Exist-ing %	Desir-ed %	Alt 1 % (short-term)	Alt 1 % (long-term)	Alt 2 % (short-term)	Alt 2 % (long-term)	Alt 3 % (short-term)	Alt 3 % (long-term)	Alt 4 % (short-term)	Alt 4 % (long-term)
2C	196	57.5	15-30	57.5	41.7	52.0	37.1	57.5	41.7	57.5	41.7
4A	3,628	27.2	10-30	27.2	21.5	25.0	22.9	26.7	25.2	26.5	19.3
4B	2,423	27.0	0-7	27.0	22.8	20.2	16.7	26.9	24.3	26.6	20.6
Area wide *	6,987	25.7	n/a	25.7	20.5	22.3	19.1	25.4	22.8	25.2	18.7

*Area wide includes all MA's, including MA 8E, 8F, and 8G, which are not managed for timber.

Jack pine composition

In the short-term, Alternatives 2 and 3 would respond equally well, reducing the amount of jack pine in MA 4B better than the other alternatives. Alternative 4 would be second best in the short-term, followed by Alternative 1. In the long-term, all of the alternatives would respond equally well in MA 4B.

Red-white pine composition
For MA 4B, Alternative 2 goes the farthest in responding to the need of increasing red-white pine composition in the project area. In the short-term, this alternative would increase the red-white pine component by 3.3 percent; in the long-term, red-white pine would be increased 6.3 percent.

For MA 4B, Alternative 3 would be the second best in responding to this need in the short-term. However, in the long-term, Alternative 4 would be the second most effective option for increasing the red and white pine component.

Species age class distribution
The IDT identified the following species with the highest need for change (objective in section 1.2.2). Given its short life span, aspen has the most critical need for age class modification.

Aspen age class distribution
Alternative 1
In the short-term, Alternative 1 would result in a shift toward older age classes. This trend would continue in the long-term. As noted in the discussion on aspen composition, above, by the year 2028, it is anticipated that there would be a loss of about 1,400 acres of aspen due to succession. Of the 5,580 acres that would remain, 67 percent (3,716 acres) would be in the 46+ year age class.

This would move the aspen age class distribution further away from desired conditions in the youngest and oldest age classes, skewing the distribution further toward the oldest age class. Currently, the average deviation of the existing from the desired conditions is 13.3 percent. This would be further increased to 28.5 percent.

Alternative 2
Table 3.2.2.2: Alternative 2 effects on aspen age class distribution

Age Class	Existing	Desired	Existing Deviation from DFC	Alt. 2 Short-Term	Alt. 2 Deviation from DFC (short-term)	Alt. 2 Long-Term	Alt. 2 Deviation from DFC (long-term)
0-10	2%	20%	-18%	14%	-6%	0%	-20%
11-20	12%	20%	-8%	4%	-16%	16%	-4%
21-45	52%	50%	+2%	62%	+12%	34%	-16%
46+	35%	10%	+25%	19%	+9%	50%	+40%
Mean			13.3%		10.8%		20.0%

In the short-term, this alternative would result in a substantial and immediate shift of aspen age class distribution toward the desired conditions. It would increase aspen's 0-10 year age class from two percent to 14 percent in the short-term mainly by regenerating 40+ year old stands. Thus, the 46+ year-old age class would be reduced from 35 percent to 19 percent. While this

alternative moves the area toward the desired conditions of 20 percent (0-10 year-old age class) and 10 percent (46+ year-old age class), it does not go far enough to meet the DFC.

It does not meet the DFC because the location of many of the older aspen stands and the CNNF forest plan's standards and guidelines:

- Many of the older aspen stands are located within beaver management zones, where the forest plan (p. 2-17) does not allow the regeneration of aspen within specified distances from designated streams. This was the most critical limitation known.
- Many of the older aspen stands are located in places where there is no access for logging equipment.
- Many older aspen stands are adjacent to features that otherwise limit the option to regenerate the stand. Examples include MA's 8E, 8F, and 8G as well as areas with high scenic integrity objectives.
- Several older aspen stands are adjacent to aspen stands in which clearcut regeneration harvests are proposed; regenerating these stands would result in temporary openings greater than 40 acres.

Thus, in designing this alternative to comply with forest plan standards and guidelines, while we moved toward short-term DFCs for aspen age class distribution we were unable to meet them.

In the long-term, the short-term attainments in age class distribution would begin to disappear. Due to the short-lived nature and rapid development of aspen, with the absence of subsequent regeneration harvests, by 2028 there would be no acreage in the 0-10 year-old age class and there again would be a great excess of acreage in the 46+ year-old age class. However, active management of aspen at present in the Lakewood Southeast Project would improve the distribution of the two middle age classes and give managers a better set of options to regulate aspen age class distribution in the future. In all likelihood, this area would be reviewed again for management needs in 15-20 years and, at that time; managers would be able to design a set of treatments that would come closer to meeting aspen age class objectives.

Alternative 3

Table 3.2.2.3: Alternative 3 effects on aspen age class distribution

Age Class	**Existing**	**Desired**	**Existing Deviation from DFC**	**Alt. 3 Short-Term**	**Alt. 3 Deviation from DFC (short-term)**	**Alt. 3 Long-Term**	**Alt. 3 Deviation from DFC (long-term)**
0-10	2%	20%	-18%	20%	0%	0%	-20%
11-20	12%	20%	-8%	4%	-16%	22%	+2%
21-45	52%	50%	+2%	57%	+7%	29%	-21%
46+	35%	10%	+25%	19%	+9%	49%	+39%
Mean			13.3%		8.0%		20.5%

As shown in Table 3.2.2.3, in the short-term, this alternative would move the aspen age class distribution much closer to the desired condition than the current condition. Because of the extensive regeneration harvests used to prevent conversion, this alternative would move the

aspen age class distribution closer to the desired conditions than the other three alternatives analyzed.

Due to the many limitations previously discussed, this alternative was unable to reduce the acreage in the 21-45 and 46+ year-old age classes to desired levels. However, it was able to meet the desired condition for the 0-10 year age class.

In the long-term, much of the acreage would shift into other age classes as the stands age. Due to movement between the 21-45 and 46+ year-old age classes, the short-term gain would be lost. However, if future managers implement additional harvests 10-15 years from now, they would have an opportunity to move the age class distribution even more in line with desired conditions.

Alternative 4

As shown in Table 3.2.2.4, in the short-term, this alternative would result in relatively little change to the aspen age class distribution. Nearly all of the change that would occur in the short-term would come because of stands aging and growing into the next successive age class. There would be a small addition to the young age class as 35 acres of aspen is clearcut. However, this would be offset by an equal acreage of aspen growing into the 11-20 year-old age class.

Table 3.2.2.4: Alternative 4 effects on aspen age class distribution

Age Class	**Existing**	**Desired**	**Existing Deviation from DFC**	**Alt. 4 Short-Term**	**Alt. 4 Deviation from DFC (short-term)**	**Alt. 4 Long-Term**	**Alt. 4 Deviation from DFC (long-term)**
0-10	2%	20%	-18%	2%	-18%	0%	-20%
11-20	12%	20%	-8%	4%	-16%	2%	-18%
21-45	52%	50%	+2%	58%	+8%	35%	-15%
46+	35%	10%	+25%	35%	+25%	63%	+53%
Mean			13.3%		16.8%		26.5%

In the long-term, the distribution of aspen age classes would become heavily skewed toward the oldest age class. With the small amount of regeneration harvests included in this alternative, by 2028, there would only be two percent of the aspen acreage in the 11-20 year-old age class and 63 percent of the acreage in the 46+ year-old age class. This alternative would move the aspen age class distribution further from the desired conditions, doubling the deviation from the DFC. Of the action alternatives, this alternative would offer the poorest response to the need to modify aspen age class distribution. Only the No Action Alternative would respond more poorly.

Northern Hardwoods age class distribution for all alternatives

In Northern Hardwoods, using shelterwood regeneration harvests would increase the acreage in the 0-20 year age class and decrease the acreage in the 61-100 year age class. However, there would still be a surplus of acreage in the 101+ year age class. Thus, by regenerating some of the acreage, we are actually getting a net increase in both the youngest and oldest age classes.

In the short-term, the 0-20 age class stays the same for all alternatives. Alternative 2 moves the closest to the desired conditions for the 21-60 and 61-100 age classes. All alternatives are close to the same for the oldest age class (see the table below).

Table 3.2.2.5: Effects on Northern Hardwoods age class distribution, short-term

Age Class	Existing	Desired	Alt. 1	Alt. 2	Alt. 3	Alt. 4
0-20	4%	16%	2%	2%	2%	2%
21-60	12%	32%	9%	16%	9%	11%
61-100	80%	32%	83%	76%	82%	80%
101+	5%	20%	7%	6%	7%	7%

For the long-term, Alternative 4 moves the closest to desired conditions for the 0-20 age class, while Alternative 2 moves the closest for the 21-60 and 101+ age classes. Alternatives 2 and 3 almost achieve the desired conditions for the 61-100 age class.

Table 3.2.2.6: Effects on Northern Hardwoods age class distribution, long-term

Age Class	Existing	Desired	Alt. 1	Alt. 2	Alt. 3	Alt. 4
0-20	4%	16%	1%	36%	38%	11%
21-60	12%	32%	3%	8%	3%	4%
61-100	80%	32%	63%	34%	34%	52%
101+	5%	20%	34%	22%	24%	33%

Jack Pine age distribution for all alternatives

For the short-term, there is no change in Alternative 1. The action alternatives get close to the desired condition for 0-10 age class, Alternative 3 the closest. All action alternatives move away from the desired for 11-30, but closer for the 31-50 age class.

Table 3.2.2.7: Effects on jack pine age class distribution, short- term

Age Class	Existing	Desired	Alt. 2	Alt. 3	Alt. 4
0-10	6%	16%	18%	15%	11%
11-30	59%	32%	64%	64%	67%
31-50	13%	32%	15%	17%	14%
51+	22%	20%	4%	3%	9%

For the long-term, all alternatives are the same for the 0-10 age class. Alternative 3 comes closest for the 11-30 age class. Alternative 4 is closer for 31-50 and 50+ age class.

Table 3.2.2.8: Effects on jack pine age class distribution, long- term

Age Class	Existing	Desired	Alt. 1	Alt. 2	Alt. 3	Alt. 4
0-10	6%	16%	0%	0%	0%	0%
11-30	59%	32%	8%	8%	16%	12%
31-50	13%	32%	80%	80%	83%	73%
50+	22%	20%	12%	12%	1%	15%

Red pine age class distribution for all alternatives
Alternatives 2 and 3 would be equally most effective alternatives for moving the red pine age classes toward desired conditions. Alternative 4 would be the next most effective, followed by the No Action Alternative, see Table 3.2.2.9.

Table 3.2.2.9: Effects on red pine age class distribution, short- term

Age Class	Existing	Desired	Alt. 1	Alt. 2	Alt. 3	Alt. 4
0-20	4%	15%	1%	7%	7%	4%
21-60	43%	30%	44%	42%	42%	43%
61-100	52%	30%	54%	50%	50%	51%
101+	1%	25%	2%	2%	2%	2%

In Alternative 4 short-term, the age class distribution of red pine would remain nearly static. An incremental shift in acreage would occur in the 61-100 and 101+ year age classes as a result of natural aging. The difference from the desired age class distribution would be reduced from 17.5 to 17.0 percent.

Table 3.2.2.10: Effects on red pine age class distribution, long- term

Age Class	Existing	Desired	Alt. 1	Alt. 2	Alt. 3	Alt. 4
0-20	4%	15%	0%	8%	8%	5%
21-60	43%	30%	38%	36%	36%	37%
61-100	52%	30%	56%	50%	50%	52%
101+	1%	25%	6%	6%	6%	6%

In Alternative 4 long-term, as a result of a small number of red and white pine shelterwood harvests and a larger amount of white pine under-planting, gains would be made in the youngest age class as red pine regeneration becomes established. The 21-60 year age class would move more in line with desired conditions as some of the stands grow into the 61-100 year class. Due to equal ingrowth and outgrowth, the 61-100 year class would remain at about 52 percent. Finally, the 101+ year age class would see some movement toward desired conditions as about 360 acres is added through ingrowth. The net result is that, in the long-term, the red pine age class distribution would move closer to desired conditions than currently. The difference from the desired age class distribution would be reduced from 17.5 to 14.5 percent.

White pine age class distribution for all alternatives
Alternative 3 would be the most effective alternative for moving the white pine age classes toward desired conditions. Alternative 2 would be the second most effective for modifying white pine age class distribution. The No Action Alternative would be the least effective, as it would not respond to the need to modify white pine age class distribution.

Table 3.2.2.11: Effects on white pine age class distribution, short-term

Age Class	Existing	Desired	Alt. 2	Alt. 3	Alt. 4
0-20	6%	12%	5%	6%	6%
21-60	9%	24%	11%	9%	9%
61- 120	82%	36%	80%	81%	81%
121+	3%	28%	3%	3%	3%

In Alternative 4 short-term, there would be essentially no immediate changes to the white pine age class distribution. However, in the long-term, the effects of Alternative 4 actions would become much more apparent. Because of the under-planting, burning, TSI, and shelterwood regeneration harvests, by 2028 there would be about 227 acres of young white pine added the 0-20 year age class. This would result in a net increase of the young white pine age class by 10 percent. At the same time, there would be a reduction of 61-120 year-old white pine acreage, putting it more in line with desired conditions. This would result from some stands moving into the next higher age class and from some stands being regenerated over the next 10 years. In the long-term, Alternative 4 would make considerable progress in moving the area's white pine age class distribution toward desired conditions. The deviation from desired conditions would be reduced from 23 to 15 percent.

Table 3.2.2.12: Effects on white pine age class distribution, long-term

Age Class	Existing	Desired	Alt. 1	Alt. 2	Alt. 3	Alt. 4
0-20	6%	12%	0%	34%	11%	16%
21-60	4%	24%	8%	6%	8%	7%
61-120	82%	36%	75%	47%	65%	63%
120+	3%	28%	16%	12%	15%	14%

Balsam Fir age class distribution for all alternatives
For short-term the alternatives all have the same effect. The 0-10 and 11-30 age classes would stay the same. 31-45 age class would decrease and the 46+ age class would increase. For long-term all action alternatives are the same. For 0-10 and 31- 45 age classes all alternatives would increase percentage with the action alternatives increasing more than the no action. For the 11-30 age class the no action would increase the most, with the action alternatives increasing, but to a lesser extent. The oldest age class would decrease some, but the action alternatives would decrease it to a greater extent, moving closer to the desired condition.

Oak age class distribution for all alternatives
Alternative 2 would be the most effective alternative for moving the oak age classes toward desired conditions. Alternative 3 would be almost as effective, followed by Alternative 4 and Alternative 1. Tables below show comparisons of the alternatives on oak age class distribution.

Table 3.2.2.13: Effects on oak age class distribution, short-term

Age Class	Existing	Desired	Alt. 1	Alt. 2	Alt. 3	Alt. 4
0-19	3%	19%	2%	3%	3%	3%
20-59	5%	38%	5%	11%	10%	11%
60-79	20%	19%	7%	13%	12%	11%
80+	72%	24%	85%	74%	75%	75%

For the long-term, Alternative 1 is closest to desired conditions for 0-19 age class. For the two middle age class all action alternatives are about the same. For the 80+ age class Alternative 2 and 3 are closest to the desired condition. Alternatives 1 and 4 work away from the desired condition.

Table 3.2.2.14: Effects on oak age class distribution, long-term

Age Class	Existing	Desired	Alt. 1	Alt. 2	Alt. 3	Alt. 4
0-19	3%	19%	16%	59%	56%	9%
20-59	5%	38%	4%	5%	5%	5%
60-79	20%	19%	2%	9%	8%	8%
80+	72%	24%	77%	27%	31%	78%

The need for stocking control
Overall, Alternative 2 best responds to the needs related to density management (see objectives in section 1.2.2), fully meeting the stated needs. Alternative 3 responds nearly as well, treating only slightly fewer pine stands. Alternative 4 partially meets the needs for action, but ranks third overall. The No Action does not respond to this need.

Communities of concern
Northern Dry Forest
Overall, Alternative 2 responds best to the need to reestablish components and processes in the Northern Dry Forest ecosystem. Alternative 3 ranks second best and Alternative 4 ranks third. Alternative 1 does not respond to this need and makes no progress toward the desired future conditions.

Pine Barrens restoration
Overall, Alternative 3 responds best to the need to restore Pine Barrens by moving about 1,000 acres in that direction. Alternative 2 ranks second highest with about 800 acres and Alternative 4 ranks third highest by changing about 300 acres. Alternative 1 does not address the need to restore Pine Barrens.

Species Diversity
In the action alternatives, under-planting white pine and hemlock (primarily) in the understories of select stands would speed up the development of northern dry forest components, namely multiple species and age classes. Multi-cohort stands of mixed pine provide much more habitat value and biological diversity than homogenous single species plantations.

3.2.3 All alternatives cumulative effects

Composition

The geographical area of consideration for cumulative impacts on vegetative composition includes those portions of the Chequamegon-Nicolet National Forest that are designated Management Area 4A and 4B. This is because forest plan management area composition objectives are on a forestwide basis. Since Management Area designations and objectives only apply to CNNF lands, the cumulative effects analysis is therefore bound only to CNNF lands. This cumulative effects analysis is also limited to only those forest types in which the Lakewood Southeast Project would result in direct and indirect effects. For the purposes of this analysis, the long-term direct and indirect effects of the Lakewood Southeast Alternatives were combined with other projects' effects. Long-term effects identify the greatest potential cumulative effects that might be expected.

Past, present, and reasonably foreseeable actions that are considered in this analysis include:
1) Past actions that have resulted in compositional changes (of the listed types) within MA 4A and MA 4B (these are already reflected in the existing condition)
2) All currently planned actions that would result in similar composition modifications
3) Future actions in which measurable changes to the aforementioned types are anticipated

In conducting this analysis, a spreadsheet was created that includes all projects on the forest with the potential to have additive effects. A preliminary review of 384 projects eliminated most of these projects from detailed analysis because they had no similar effects or because their effects would not overlap with the effects of the Lakewood Southeast Project in time and space. This left a list of eight projects, in addition to Lakewood Southeast, that could cumulatively affect forest composition within MA 4A/4B on the CNNF.

Management area 4A

There are a number of other projects on the forest in Management Area 4A. The analysis used MA 4A upland composition with information from other districts. In total, these projects are projected to result in measureable changes to composition – most notably, losses to aspen, paper birch, and jack pine; gains to red-white pine and northern hardwoods. Table 3.2.3.1 displays the expected cumulative changes in the vegetative composition of MA 4A from each project alternatives and other past, present, and reasonably foreseeable projects.

Table 3.2.3.1: Summary of cumulative effects to composition of MA 4A forest types

Upland type	**Forest-wide existing condition (acres)**	**Exist-ing**	**Desired**	**Alt. 2 change (acres)**	**Alt. 2 (%)**	**Alt. 3 change (acres)**	**Alt. 3 (%)**	**Alt. 4 change (acres)**	**Alt. 4 (%)**
Aspen	32,870	28.6 %	10-30%	-1,599	27. 2%	-1,297	27.4%	-2,084	26.8%
Balsam fir	1,547	1.3%	0-3%	-310	1.1 %	-340	1.0%	-310	1.1%
Paper birch	2,425	2.1%	0-5%	-528	1.6 %	-528	1.6%	-528	1.6%

Jack pine	13,413	11.7 %	0-35%	-530	11. 2%	-453	11.3%	-530	11.2%
Red/ white pine	41,755	36.3 %	10-50%	+2,127	38. 1%	1,861	37.9%	2,037	38.1%
Northern hardwood	9,188	8.0%	0-25%	+685	8.6 %	535	8.4%	1,336	9.1%
Oak	9,349	8.1%	0-25%	+248	8.3 %	173	8.3%	151	8.3%
Permanent openings	3,094	2.7%	1-6%	-71	2.6 %	51	2.7%	-71	2.6%
Other types	1,443	1.3%	0-5%	-23	1.2 %	-3	1.3%	-3	1.3%
Summary	115,083	100 %		0	100 %	0	100%	0	100%

Management Area 4B

There is only one other past, present or reasonably foreseeable project occurring in MA 4B on the forest which would result in vegetative compositional changes. The Flower Lake Stewardship Project is located within the Lakewood Southeast Project Area. The project is ongoing and includes mainly intermediate harvests and fuel reduction treatments. A conversion of only 23 acres would result from that project. Thus, the cumulative effects to vegetative composition in MA 4B would be very limited, summarized on Table 3.2.3.2. It is limited only to the red-white pine and jack pine types since there would be no cumulative effects in other types.

Table 3.2.3.2: Summary of cumulative effects to composition of upland MA 4B forest types

Type	**Forest-wide existing condition (acres)**	**Exist -ing**	**Desired**	**Alt. 2 Change (acres)**	**Alt. 2 (%)**	**Alt. 3 Change (acres)**	**Alt. 3 (%)**	**Alt. 4 Change (acres)**	**Alt. 4 (%)**
Jack pine	2,212	8.4%	3-6%	-196	7.6%	-189	7.6%	-196	7.6%
Red and white pine	7,508	28.3 %	45-70%	+54	28.6 %	+153	28.9 %	+281	29.4 %
All	26,488								

Structure

The geographical area of consideration for cumulative impacts on vegetative structure (age class distribution) is the area covered by National Forest lands that are in the upland portion of the project area. Forest-level guidance recommends analysis of age class distribution at the project area level. This provides a consistent and discrete method of analysis that is useful for comparison. This area is further limited to the area occupied by those cover types in which the age class distribution would be directly or indirectly affected (no direct/indirect effect means no cumulative effect).

Past actions considered in this analysis include all actions, which have already taken place. Some of these actions have resulted in changes to age class distribution. The existing condition reflects those changes.

One present action would affect age class distribution. This is the Flower Lake Stewardship Project, located in the northern third of the project area.

Reasonably foreseeable future actions considered in this analysis include any actions that would result in changes to age class structure in the project area. At this time, the only foreseeable future projects within the project area are pine thinning timber sales from the Plantation II Thinning Project (2008). Thinning red pine would have no effects on age class distribution since this would be an intermediate treatment.

3.3 Transportation System

Introduction
The following section is a summary of the Transportation Report, addresses Issue B, and the entire transportation system for the project. The section would describe management requirements, methods of analysis, environmental consequences, and cumulative effects of each alternative on the transportation system.

Management requirements and Road Construction/reconstruction (Issue B)
The objective of the Forest Service travel analysis (TAP) is to provide line officers with critical information to develop a road system that is safe and responsive to public needs and desires, is affordable and efficiently managed, has minimal negative ecological effects on the land, and balances with available funding for needed management actions. Travel analysis assesses the current condition of the road system on the CNNF. Comparing the current to a desired condition identifies needs for change such as upgrading, constructing, or decommissioning.

Unauthorized roads (non-forest system road) already exist and some of these roads may be necessary for reducing the skid distance to comply with the forest plan guidelines. These guidelines for timber management recommend a 1/4 mile skidding distance (see objectives in section 1.2.2) in most cases (forest plan guideline, p. 2-38). Many of the unauthorized roads may not have adequate clearances for larger modern log hauling trucks. The District would improve these roads in order to facilitate safe and economic hauling.

In some cases where access is limited, or nonexistent, roads would need to be constructed. The District would close constructed roads after project activities are completed.

Some of the designated decommission roads are already closed, 27.9 miles; these roads may have their own physical closure, or come off a road that has a closure, such as a gate. The District would not work on naturally (overgrown with vegetation) decommissioned roads.

Methods of analysis
This project includes road densities within portions of each of three Recreational Opportunity Spectrum (ROS) polygons within the project area (see Table 1.2.1). The forest plan provides upper limits for open and total road density for each ROS designation forestwide. The forest plan focuses efforts on decreasing over-all average road densities from appendix BB. In addition to these limits, it also sets guidelines for Management Area 8 and the Eastern Timber Wolf. Road densities are calculated by measuring the actual mileage that lies on Forest Service ownership, except for the wolf area density calculations, which includes all lands within the project area within each wolf area polygon.

3.3.1 Affected Environment
The analysis area for this section is the project boundary. The project boundary was chosen because of immediate direct and indirect changes to transportation. Currently, the total road mileage on national forest within the project area is approximately 258 miles. The type and condition of the roads varies from asphalt surface with shoulders to un-surfaced "woods roads".

Total road density in the project area
The total road density for the project is 4.51 miles per square mile. This includes all measurable roads within the project, which includes open and closed, system, and unauthorized. The District would close roads constructed for management activities, so they would be accountable on the total road density-not open road density. Road reconstruction, which improves current roads is already figured into the road density and would not change total or open road density.

Open road density in the project area
The open road density for the project is 2.82 miles per square mile. There are 1.82 miles per square mile of open system roads and 1.0 mile per square mile of open unauthorized. These figures include all open system roads, and unauthorized roads. There are currently 161.02 miles of open roads on federal land within the project area, excluding State and County roads.

3.3.2 Direct and indirect effects for the transportation system
Each action alternative would have beneficial effects in moving the project towards the road density objectives set forth in the forest plan, while protecting natural resources.

Alternative 1
Normal road maintenance such as grading, brushing, and drainage structure maintenance would continue. There would be no ground disturbing activities such as road construction or decommissioning. There would be no changes in road densities because of this alternative. Consequently, there would be no movement toward forest plan objectives. This alternative ranks 4th in reducing road density.

Action alternatives
Total road density
Total road densities include decommissioning, which reduces the existing road density figures. New road construction also affects total road densities by increasing the density. The amount of reduction in total road density far exceeds the additional constructed roads.

The total road density would be approximately the same for all alternatives. See table below.

Table 3.3.2.1: Total road density by alternative (miles/sq. mile)

ROS	Existing cond.	Alt. 1	% change	Alt. 2	% change	Alt. 3	% change	Alt. 4	% change
Project area	4.51	4.51	0	3.43	-24	3.42	-24	3.43	-24

Open road density
The overall open road density would be 1.99 miles per square mile for each action alternative. In terms of overall open road density, each action alternative reduces open density in the project by 29 percent. All action alternatives equally move the area towards forest plan goals. See table below.

Table 3.3.2.2: Open road density by alternative (miles/square miles)

ROS	Existing cond.	Alt.1	% change	Alt.2	% change	Alt.3	% change	Alt. 4	% change
Project area	2.82	2.82	0	1.96	-29	1.96	-29	1.96	-29

Many of the unauthorized roads were developed by past logging activities and may not have adequate clearances for larger modern log hauling trucks. Other low-level system roads may have been placed in storage until the next management activity. Under Alternatives 2 and 3, some unauthorized roads would be added to the system to provide long-term management needs; improvements may need to be performed in order to facilitate safe and economic hauling. In addition, several miles of existing system roads would be repaired. These roads typically do not receive any maintenance unless there are safety hazards or other damage occurring. These improvements do not affect open or total road densities; they are already included with the current road density figures.

Under Alternative 4, no roads would be reconstructed. This may make it difficult or impossible to access some of the stands. Without improvements on already existing roads, hauling maybe reduced, and longer skid distances required, which would reduce the value of the timber sales.

3.3.3 Cumulative effects

The timeframe for cumulative effects analysis starts in the 1800s (when transportation network was developing) and includes known future projects. Geographic bounds are the project boundary. This area was selected because of the effects to the transportation network that would occur within the confines of the project. Since there is no direct or indirect effects for the Alternative 1; therefore, there cannot be any cumulative effects.

Action alternatives

Past activities

There was an extensive network of railroads developed for the logging of this project area during the late 1800s and early 1900s. People built this network due to the lack of a river and stream network for the movement of logs to area saw mills. Portions of this network are still visible today and include some of the unauthorized roads within the project area. In addition, most of the collector, arterial, and some local roads were developed during the CCC Era (1935-1942) resting on old railroad grades. Building of additional local roads occurred in the late 1970s and 1980s. Some of the low standard local roads built in the late 1930s are now completely overgrown.

Since the approval of the first forest plan in 1986, the forest has continued to construct and reconstruct fewer local roads and this trend continues under the current forest plan. In 1999, the CNNF made an administrative decision to minimize specified roads in the timber sale program.

Present activities

The existing condition reflects all past road construction and closures. The only present action is the CNNF updating the MVUM.

Future activities

There is no planned construction in the foreseeable future. The Plantation II Thinning Project does not include any road changes. The CNNF may add or delete roads from the system network during future revisions of the MVUM.

Conclusion

All action alternatives would reduce the overall road densities within the project area and associated ROS polygons towards plan objectives now and in the future. The roads identified for reconstruction in Alternatives 2 and 3 are existing roads, and are included in the figures for Alternatives 1 and 4. Some timber stands that need treatment may be difficult, or impossible to access, without reconstruction improvements to the existing road system.

3.4 Biological Evaluation

This is a summary of the Biological Evaluation (BE) Report. The complete BE is available on the CNNF website.

Management Requirements

The purpose of Biological Evaluations and Assessments (BEs, BAs) is to "review all USDA Forest Service planned, funded, and executed, or permitted programs and activities for possible effects on endangered, threatened, proposed, or sensitive species" (Forest Service Manual [FSM] 2672.4).

The Forest Service (FS) is responsible for protecting all federally proposed and listed species and the Regional Forester Sensitive Species (RFSS). The Endangered Species Act requires federal

agencies to "implement a program to conserve fish, wildlife, and plants . . . to insure their actions do not jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of critical habitat".

Forest Service Sensitive Species Policy (FSM 2670.32) calls national forests to assist states by:

- achieve conservation goals for endemic species;
- complete biological evaluations of programs and activities;
- avoid and minimize impacts to species with viability concerns;
- analyze significance of adverse effects on populations or habitat;
- coordinate with states, United States Department of Interior Fish and Wildlife Service (FWS), and National Marine Fisheries Service.

Methods

All threatened and endangered species, along with all RFSS that have habitat and potential for occurrence in the project area were analyzed for this project. This analysis is detailed in the BE. Direct, indirect, and cumulative effects were discussed for those species with habitat, potential for occurrence, and potential impact by proposed projects. Cumulative effects analysis evaluated past, present, and reasonably foreseeable proposed projects in the BE. All analyses utilize the best available science at the time of analysis. The BE, section 6.0 explains the criteria for what species were analyzed for expected impacts by alternative. The MIS that were also RFSS are analyzed in the BE. Monitoring efforts and trends are documented in the BE and the CNNF Monitoring and Evaluation Reports.

Each RFSS was reviewed for new information. This review included consultation with local and state experts, new literature, and scientific information used in the development of the forest plan. Considering the best available and most recent scientific information, the relevant factors for each species were determined.

In systematically analyzing cumulative effects of this project and many other projects, information about all major current and planned vegetation management projects on the CNNF were evaluated. This information was organized by species and by using their habitat models, we are able to calculate the current amount of habitat (acres) and annual changes to the availability of this habitat resulting from the short and long-term effects of each management project. For the purposes of wildlife effects analyses, short-term effects are five years or less and long-term effects are greater than that (often up to 50 years) (St. Pierre 2010). Where applicable, in growth and outgrowth of habitat (changes resulting from natural aging of stands) was also projected. These projections represent a major component in the cumulative effects analysis for any CNNF project and the cumulative effects analysis boundary. Data used in the cumulative effects analysis for individual species can be found in the project record.

The FS is responsible for disclosing the effects of its actions on TES and RFSS where they occur within National Forest boundaries. A list of species considered, RFSS likely to occur, and determination for TES and RFSS tables are listed in the BE. The species in the BE discussed in detail and summarized here are eastern timber wolf, wood turtle, red-shouldered hawk, black-backed woodpecker, Connecticut warbler, American marten, and three species of bats.

Private lands were analyzed inside and within a one mile buffer outside the project area. The one mile extended analysis of adjacent property is specifically for red-shouldered hawks that required cumulative effects analysis and for goshawk that are a Management Indicator Species. The one mile distance far exceeds the distance they are known to relocate following abandonment or disuse of a previously occupied nest site (Ennis, K. R., J. Blum, J. Kelly, C. Schumacher, E. Padley, and T. Schuetz 1993) (Bosakowski 1990) (Woodford J. , Proposed Wisconsin Department of Natural Resources Management Guidance for Northern Goshawks 2005). This provides context for the relative availability of habitat on adjacent, non-USFS lands.

Private lands within the one mile buffer are mostly lowland habitat (12 percent conifer and 11 percent openings), forested habitat (11 percent upland hardwoods, 10 percent young aspen), and agricultural land. The largest blocks of upland habitat for red-shouldered hawks are east and south of the project area. There also is lowland habitat that is also just south of the project area. Suitable habitat for Connecticut warbler and black-backed woodpeckers is found to the south and southeast of the project area.

Comprehensive data on these private lands including age structure within each forest type category, specific management history, and future management plans are not available. Given this limitation, the following assumptions for the analysis were made:

- The age structure of the forested lands is similar to the age structure of the same forest types on the CNNF.
- All forested lands are enrolled within Wisconsin's Managed Forest Law (MFL) program. For any adjacent and other ownership lands that are managed for timber production, there are tax incentives to enroll in this program; therefore, it is logical that such an assumption is reasonable. While there are probably adjacent and other ownership lands that are not managed for timber. For the purposes of this analysis of cumulative effects of timber harvesting, assuming that all lands are managed for timber production presents a "maximum effect" scenario.
- Non-USFS lands that are classified as northern hardwoods are treated on a 15-year re-entry interval, are harvested when they reach approximately 120 square foot/acre, and are reduced to 80-90 square foot/acre basal area. This generally corresponds with a selection harvest with canopy gaps.
- Aspen stands are clear-cut when they are approximately 45 years of age.
- Lands that are currently aspen cover type would be maintained as aspen and lands that are currently hardwoods would be maintained as hardwoods. No adjacent and other ownership lands are converted to other forest types. The assumption is more likely to be broken by conversion of aspen to hardwoods than hardwoods to aspen.

TES

Canada Lynx, Fassett's Locoweed, and Kirtland's warbler had a determination of "no effect" due to these species do not occur or have potential habitat in the project area.

RFSS

The following species are RFSS that occur or have potential habitat in the project area. As a result, of this they that have protection guidelines in the forest plan (p. 2-19 through 2-24).

3.4.1 Eastern Timber Wolf

Methods

Since the early 1980s, the CNNF has participated annually in wolf survey and monitoring activities, with the WDNR and the FWS. Survey and monitoring activities consist of winter carnivore tracking surveys, summer howling surveys, radio tagging of new wolf packs, and weekly aerial telemetry tracking of radio marked packs. These survey and monitoring activities provide the CNNF with critical information on pack establishment or losses, animal and pack movements, territory locations, shifts and sizes, breeding activities, productivity, and causes of mortalities.

Threshold

The CNNF wolf population has exceeded the four pack/40 animal goal set in the federal recovery plan (FWS 1978 and 1992) for at least five years. It has exceeded the 80 animals/three consecutive year goal of the Wisconsin state recovery plan for a similar period of time (WDNR 1999). Across Wisconsin, the gray wolf population had a winter 2010-2011 estimate of 782-824 animals (Wydevenet al 2011). A threshold of effects would be crossed if management activities on the Forest would cause the CNNF to fail to meet population goals set forth by the FWS, and the WDNR.

In 2012, the WDNR approved the first wolf-hunting season in the state of Wisconsin. Management of wolf populations and harvest quotas are controlled and determined by the WDNR and as a result is beyond the scope of this project and control of the CNNF; however, some general analysis is provided.

The WDNR set a statewide wolf harvest quota of 201 wolves, 85 of which were reserved for American Indian tribes. There were six-wolf management zones and each with a harvest quota. The project area is part of Zone 2 that had a quota of 20 wolf kill permits. This zone covers the northeastern section of the state and includes portions of 11 counties (WDNR 2003). Within Zone 2, the wolf population was estimated to include about 44 packs with a total of 191-203 wolves. The project area only has two percent of Zone 2's wolf population and those pack territories cover only about 25 percent of the project area. Harvesting wolves from the project area is possible but it is very unlikely to result in eradication of that population. This is due in part to the low density of wolves, small territory size of the packs in the project area and the difficult challenges with hunting wolves. Wolf hunting in Zone 2 was closed on Nov. 16, 2012 after 19 wolves had been harvested since the opening date of the season; no wolves were harvested within the project area. It was closed prior to reaching the quota to ensure hunters did not exceed the quota. The WDNR thought this was a possible outcome because they were anticipating an increase in harvest rates with the opening of the nine day deer hunt the following weekend (WDNR 2003).

3.4.1.1 Affected Environment

There are two wolf pack territories confirmed in the project area; however, majorities of both territories exist outside the project area on non-FS property. The Peshtigo Brook pack consists of two animals and has about 25 percent of its territory along the eastern boundary of the project area. The Evergreen Pack has two animals and has only about 0.5 percent of its territory in the

southeastern part of the project. There are no confirmed locations of wolf dens or rendezvous sites within the project area.

3.4.1.2 Environmental Consequences

Direct and indirect effects to wolves are analyzed at the scale of the project area. If there were direct and/or indirect effects, cumulative effects would be analyzed at the scale of the project area as well as at the scale of the entire CNNF. Such a cumulative effects analysis area is appropriate because the species is highly mobile and may move between the Chequamegon and Nicolet landbases of the CNNF.

Direct and Indirect Effects

Alternative 1

Under this alternative, no vegetation management or road construction would occur and there would be no effect on wolves.

Action alternatives

Disturbances to wolves are not anticipated from the action alternatives. Potential disturbances would include such activities as increased human presence during the logging operations, increased truck traffic, and noise generated from the trucks, saws, and logging equipment. No disturbance would be anticipated because both wolf packs have such a large part of their territories off the CNNF and away from the project that they may not be near the activities when they occur. If the wolves were close to these activities, they would be able to move easily and freely about the rest of their territory to undisturbed areas that could occur inside or outside the project area. Also, since parts of the packs' territories do reside on the CNNF (and have for many years), these types of activities would not be new occurrences in their environment. The animals may already have a certain tolerance for them. There could be direct effects on wolves if treatments were to occur at a den or rendezvous site. This is because presently, no den or rendezvous sites have been identified in or near the project area. If a den or rendezvous site is located prior to or during project implementation, design features would immediately be implemented to remove any direct effect to wolves. Indirectly, prey density, especially white-tailed deer would be expected to fluctuate somewhat, but generally stay near established goals and therefore provide a consistently available prey species.

Implementation of the action alternatives would reduce both open and total road density from the existing condition and from Alternative 1. Decommissioning has a direct effect of putting more land back into a productive state, which can eventually lead to increased forest cover and wildlife habitat. Due to declassification and trail conversion, there would be less public motorized access within the project area. This could result in fewer impacts to wolves from accidental or intentional shootings or trapping.

3.4.1.3 Cumulative Effects

Alternative 1

Without any direct or indirect effects on wolves, there can be no cumulative effects.
Determination: No effect.

Action Alternatives

Given there would be no direct or indirect effects on wolves because of the project under any of the action alternatives; therefore, there would not be any cumulative effects on wolves.

Determination: No Impact. Wolves do not require any particular forest type, thus the timber management under the action alternatives would not have an effect on wolves except for the possibility that wolves would temporarily avoid treatment areas while the logging operations are occurring.

3.4.2 Wood Turtle

Methods

The forest plan (p. 2-22 to 2-23) and its' FEIS include management guidelines in the following section: RFSS Standard and Guidelines, and Wood turtle Guidelines:

- Protect known communal wood turtle nesting sites from predator impacts, where feasible, and protect from site disturbance due to construction, or recreation use impacts.
- Stream bank stabilization projects must protect wood turtle nesting sites. Utilize the following design features: (1) Reshape the bank and smooth contours when revegetating exposed stream banks; (2) Partially cover stabilization structures with sod and revegetate with species similar to those growing on the adjacent bank; (3) Vary the rock size and utilize native rock for rip rap and within-water rock structures; and (4) Maintain natural lake edges and stream meanders when making shoreline and within stream improvements.

Surveys have been conducted to assess habitat on the district and to locate other existing or potential nesting sites.

Threshold

No threshold of effects has been established for this species. However, the BE for the forest plan (appendix J p. 98 to 100) identifies key factors that were determined to be important to the assessment of viability of wood turtles. These key factors were derived from the species viability evaluation process for the forest plan revision. Key factors include steep, eroding, sandy, or gravely slopes along riverbanks for nesting and down logs and other woody debris.

3.4.2.1 Affected Environment

There is the only large communal turtle-nesting site on the district, along the Oconto River. There have been twenty observations of wood turtles; all of these have been in the southern half of the district. Other locations throughout the project area have the potential to create turtle nesting habitat (see the chart locations in the project file). The LSE project proposes to implement management at these locations. Of these locations approximately two to three will be developed based on silvicultural prescriptions (that have not yet been developed) and post-harvest conditions of the stands.

3.4.2.2 Environmental Consequences

Two spatial scales were used to evaluate effects on wood turtles. For evaluating direct and indirect effects, the project area was used. Any turtles foraging in upland habitat within 300 meters from an occupied river have the potential to be affected directly (through disturbance or direct contact of harvesting equipment) or indirectly (by loss or modification of habitat). To

analyze cumulative effects to the wood turtles, the district landbase was used because of the turtle's limited mobility. Although the species is known to occur in both the Chequamegon and Nicolet landbases, most of the records are from the district (forest plan FEIS, page J-98). Because of the turtle's limited mobility, non-connectivity of river systems occupied by wood turtles, localized nature, as well as the small number of occurrences on the Chequamegon and Eagle River-Florence Ranger District landbases, it is unlikely that any interactions occur between populations of the species between these landbases.

Direct and indirect effects

Alternative 1

Under this alternative, no vegetation management or road construction would occur and there would be no effect on wood turtles and their habitat would remain in its current condition for several years.

Action alternatives

Design features will have seasonal harvest restrictions, which will only allow harvest activities between October 01 and April 30 while the turtles will be hibernating in streams. It will also eliminate any chance of killing or injuring turtles with the harvest equipment. The others stands do not require design features because they are not suitable habitat and/or the stand has little to no area in the 300-meter buffer located at the furthest boundary from the river. Selection, thinning, and shelterwood harvest treatments would maintain a mix of closed and open canopy and forest edges that wood turtle prefer (Bowen 2004). Clear cut treatments in the 300-meter buffer would total 228 acres (2.8 percent) for Alternative 2, 335 acres (4.1 percent) for Alternative 3, and 34 acres (0.4 percent) for Alternative 4, which would occur in aspen dominated and jack pine stands. These stands are scattered across the project area, at low percentage of the 300 meter buffered area, and thus would not cause a threat from being at a broad scale (Bowen 2004).

There will be opportunities to create turtle nesting sites within stands that have proposed treatments and are adjacent to streams, which have documented wood turtle occurrences. Alternative 2 has 10, Alternative 3 has seven, and Alternative 4 has 10 possible stands that are suitable for these sites. A selection of 2-3 of these locations will be based on site-specific conditions that will be determined when the harvest at these candidate areas occurs (possible site locations are listed in the project record). Some major criteria used for selection would be funding, adequate access for equipment, remoteness, and open exposure to south or southwest and within 200 feet from stream. The nesting sites would be at least 3,000 square feet in size (e.g. 55'by 55" or 35' by 86'). The existing vegetation and top soil would be removed by bulldozer to help reduce and delay the establishment of vegetation. A heavy-duty geotextile fabric (similar to that used to stabilize dikes) is placed on area to help stabilize and to halt weed growth. The nesting material is a mix of concrete sand and crushed road shoulder gravel mix that is dumped over the entire site at a depth of about four inches. A six-foot tall chain link or welded wire exclusion fence will be constructed around the nesting site to keep raccoons, foxes and other predators out of the nesting area.

No proposed biomass removal or prescribed burn projects occur in stands within the 300-meter stream buffers and thus will have no effect on wood turtles and or their habitat.

Road management within the 300-meter buffer area would have the same results with all action alternatives in decommissioning, closing, maintaining open roads and motorized trails. The only difference is with construction of roads that would then be closed after use. Road construction activities would occur in months of turtle inactivity and thus would have no effect on the wood turtles. All other road management activities would have positive effects because they would be

reducing the amount of road miles in the area. This would then decrease vehicle traffic in the area that would also reduce the chance of vehicles hitting turtles on these roads.

Although they are a forest species, they appear to prefer areas in which there are openings (see objectives in section 1.2.2) in the streamside canopy rather than unbroken forest. This area has the largest openings for solar radiation and good sandy soils, but is limited in its vicinity to waterways and receives heavy vehicle use.

Selection, thinning, and shelterwood harvest treatments would maintain a mix of closed, open, and forest edges that wood turtles prefer.

3.4.2.3 Cumulative effects

Alternative 1

Without any direct or indirect effects on wood turtles, there can be no cumulative effects. Determination: No effect.

Action alternatives

Because no negative effects are anticipated under the alternatives analyzed, there would be no direct or indirect effects to wood turtles in the project area. Because there are no direct and indirect effects, no cumulative effects exist to be analyzed.

Determination: Beneficial Effect. There will be no impact from the management activities within the 300-meter buffer around rivers with known wood turtle activities due to design criteria to avoid effects to wood turtles. No activities are occurring near the one known communal nesting site within the project area. Beneficial effects would result from the creation of the turtle nesting sites in stands that have proposed treatments adjacent to streams that have wood turtles.

3.4.3 Red-Shouldered Hawk

Methods

Surveys consisted of a combination of walking through target stands in a grid pattern to look for nests, and playing of red-shouldered hawk alarm calls to elicit a response from territorial birds. Playback stops were done approximately every 200 meters, although some stands had a higher rate of stops. The majority of the surveys were done during early spring, during the courtship phase. Follow up surveys were conducted at sites that had a positive response. These surveys were conducted until a nesting territory was located or it was determined that no breeding activity was occurring. A conspecific call was played at predetermined locations to “cover” all potential habitats near the response area. Visual search for nests in theses stands were also conducted while walking to the next survey point.

Models for red-shouldered hawks were developed to apply available data to this science so that determination of suitable habitat could be spatially and temporally assessed (St. Pierre 2010). These models include a description of suitable habitat, both in qualitative terms and in the Forest Service’s Vegetation (FSVeg) database, which describes forest cover or vegetation type, size, density, and year of origin. The habitat variables of forest type, age of the stand, and canopy cover were chosen because they represent the larger suite of variables (including tree height,

stand basal area, amount of large woody debris and snags) that are related to species' habitat preferences.

Different forest types are defined by the tree species diversity within the stand. The age of the stand is correlated with the structural complexity of the stand; older stands have more structure (downed wood, snags, trees of variable height, etc.) It is recognized that the relationships between stand age and these other variables may not be linear but they are positive height (Carmean, W.H., J.T. Hahn, R.D. Jacobs 1989), LWD in 40+ year old stands (Gore, J.A. and Patterson, W.A. III 1985). The outcome of a review of the literature resulted in setting an age cut-off (50 years) by which time it is expected that the tree heights and diameters, and LWD accumulation have exceeded the minimums suggested in the literature for a number of species with an affinity for mature hardwood forest (such as northern goshawk, red-shouldered hawk, and American marten). Additional variables such as slope, density of predators, amount of tip-up mounds in the stand, fragmentation metric, patch size, and proximity to water either could not be included in a habitat model because no data exists. On the other hand, if included in the model, any threshold (e.g. minimum patch size) criteria would have been poorly linked to the biology of these species on the CNNF. Furthermore, the potential gains in the accuracy of the models would have been undermined by our guesses at the values of these habitat components for which we have no data on the species' minimum requirements or maximum tolerances.

For the red-shouldered hawk (this model is also used for the northern goshawk), canopy closure was an important variable in determining the suitability of habitat such that greater canopy closure is better for the species. In an analysis of the habitat currently being used by these species on the CNNF, 80 percent emerged as an appropriate threshold for canopy closure and it is consistent with the habitat use of these species elsewhere in North America.

Utilizing information from Woodford et al (2008) on red-shouldered hawks, an analysis was conducted to evaluate if proximity to water could be a useful criteria in order to refine the red-shouldered hawk suitable habitat model. The results showed that incorporating a distance to water criteria into the current red-shouldered hawk suitable habitat model resulted in a less than four percent change in acres of suitable habitat at the 68 percent confidence interval. At higher confidence intervals, the amount of change was slightly over one percent. From these results it was determined that such small differences between the models is an indicator that wetland resources are well distributed in the landscape in the vicinity of stands currently considered red-shouldered hawk habitat (St. Pierre, et al 2008 unpublished report).

In the modeling of suitable habitat availability on the CNNF for RFSS (or MIS), the best available scientific information was considered and as new scientific information continues to become available it is reviewed and habitat modeling on the CNNF would integrate the new science appropriately.

The primary concern with effects of forest management to red-shouldered hawk has been on disturbance to nesting individuals. This emphasis is evident in the forest plan, which provides guidelines for limiting land-use activities within at least 30 acres surrounding the nest (p. 2-20) to actions that do not reduce canopy closure. A secondary nest protection zone limits activities to uneven-aged management of their habitat with an emphasis on high canopy closure (at least

80 percent). Activities are also limited seasonally to avoid disturbing the birds from nesting through fledging and post-fledging (Feb 15-Aug 1; p. 2-21). Habitat suitability modeling on the CNNF in the past eight years has focused on nesting habitat.

Threshold
In the species viability evaluation (SVE) process for the forest plan no minimum numbers of red-shouldered hawk or its habitat were identified although the quantity of habitat was expected to be relatively stable through implementation of the forest plan (forest plan BE; p. J-74). The cumulative effect analysis for the project would determine if the trend in the quantity of suitable habitat is stable, increasing, or decreasing.

3.4.3.1 Affected Environment
There are 10 historical (any nesting territory that has been active in the past 10 years) territories in the project area; five of these currently have nests in a tree. There are 10 active red-shouldered hawk-nesting territories within the project area. A total of 3,399 acres were surveyed during 2010 – 2011survey season and one new nesting territory was located.

3.4.3.2 Environmental Consequences
For evaluating direct and indirect effects to the species, the project area was used.

Multiple spatial scales were used to evaluate meaningful effects to red-shouldered hawk. For evaluating direct and indirect effects to the species, the project area was used. Any red-shouldered hawks nesting or foraging within the project area have the potential to be directly (destruction of nest tree) or indirectly (loss of habitat) affected by the proposed activities. Cumulative effects to the species are analyzed at the scale of the district and at the Nicolet landbase (not the entire CNNF). This analysis area is appropriate for three reasons:
1) The cumulative effects area is contiguous and, because it is predominantly a forested landscape, it is reasonable to assume that individuals could move freely within this boundary.
2) Red-shouldered hawks are rarely found on the Ottawa NF and it is unlikely that those found in the northernmost portions of the Nicolet landbase use the Ottawa NF (Eklund pers. comm. with Robert Evans 5/11/2005). Red-shouldered hawks are rare on the Ottawa and possibly only nest in the Sylvania Wilderness (Jacobs, J., and E. A. Jacobs 2002).
3) The degree to which populations on the Chequamegon and Nicolet landbases interact is unknown, but no bird bands or other information exists that compels an analysis area that is so large as to include both the landbases of the CNNF.

Summaries of the availability of suitable habitat across the entire area are presented to provide further context for the effects analyses. The temporal scale of the cumulative effects analysis includes past actions (with emphasis on those that have occurred over the past five years) and those that are reasonably foreseeable.

Direct and indirect effects
Alternative 1
There would be no vegetation management under this alternative; therefore, there would be no effects to red-shouldered hawks or their habitat from timber harvest treatments. The result of not implementing any timber harvesting activities would be the passive maintenance or enhancement

of nesting habitat for the species. This would occur from northern hardwood stands continuing to develop large trees (suitable for nest sites) and maintain or increase canopy closure, which are important features of red-shouldered hawk habitat. Road activities and wildlife opening improvement would not be implemented, thus impacts to this species would not occur specific to these actions. In this alternative, the amount of coarse or fine woody debris deposited on the forest floor would not change from the current accrual rate. This biomass would continue to provide forage and cover habitat for several red-shouldered hawk prey species.

Action Alternatives

Direct impacts to birds would be minimized from implementation of protective no cut buffer around active nest sites. If any new territories were located in the future, habitat protection measures would be implemented.

Effects from the initial analysis showed that at the time of implementation and five years post implementation for Alternative 2 and 3 there would be a loss of 30-37 percent of suitable habitat. This would mainly be due to the many shelterwood harvests planned in mature oak and upland hardwood stands. This amount was a concern based on the assumption that all of the shelterwood harvests proposed include additional seed/removal cuts making that habitat unsuitable for > 50 years.

Table 3.4.3.2.1: Red-shouldered hawk habitat at the scale of the project, district, and Nicolet landbase. For the 2011 and 2018 projections, the effects of all other projects within the analysis area are included.

Project Area	**Alt. 1**		**Alt. 2**		**Alt. 3**		**Alt. 4**	
Current Condition (2011)	8,664		8,664		8,664		8,664	
Following Implementation (2013)	8,657	-0.1%	5,484	-36.7%	5,706	-34.1%	7,942	-8.3%
Five years after Implementation (2018)	8,841	2.0%	5,849	-32.5%	6,071	-29.9%	8,248	-4.8%
Lakewood-Laona Ranger District	**Alt. 1**		**Alt. 2**		**Alt. 3**		**Alt. 4**	
Current Condition (2011)	139,255		139,255		139,255		139,255	
Following Implementation (2013)	139,033	-0.2%	135,860	-2.4%	136,082	-2.3%	138,318	-0.7%
Five years after Implementation (2018)	137,931	-1.0%	134,939	-3.1%	135,161	-2.9%	137,338	-1.4%
Nicolet National Forest	**Alt. 1**		**Alt. 2**		**Alt. 3**		**Alt. 4**	
Current Condition (2011)	260,697		260,697		260,697		260,697	
Following Implementation (2013)	257,005	-1.4%	257,005	-1.4%	257,227	-1.3%	259,463	-0.5%
Five years after Implementation (2018)	258,546	-0.8%	255,554	-2.0%	255,776	-1.9%	257,953	-1.1%

In an effort to reduce the long-term effects of the proposed treatments on red-shouldered hawk habitat, approximately 1,035 acres of suitable habitat (429 acres oak and 606 acres upland hardwood) would be limited to shelterwood prep cuts that would be similar to a commercial thin cut. While these treatments would probably result in fewer acres of young oak stands over the next fifteen years, they would still move the stands toward long-term desired conditions while ensuring nesting habitat is maintained. These stands are located in the core use area for red-shouldered hawks within the project area and contain active nest sites or are adjacent to untreated stands with active nests. Also, these stands are near or adjacent to each other, which would then

continue to provide the large block hardwood habitat that this species utilizes. As a result, this would eliminate the long-term unsuitable habitat conditions from the original proposal to these stands being unsuitable habitat for possibly five years instead of 50 years and thus reducing the impacted acres by almost 12 percent. The acres of affected habitat could be less because the harvested stands may still be suitable and utilized by red-shouldered hawks immediately after harvest. This is due to the stands would have a canopy closure between 70 – 80 percent which is a level that red-shouldered hawks have used in stands for nesting (Jacobs, J. and E. A. Jacobs 2002). Additionally, the mature upland hardwood trees would remain throughout the stand with improved growth and possibly used as nest trees. In addition, in the "core area stands" winter harvest only design features would be implemented to insure no disturbance to the birds during the breeding season from harvest operations.

Table 3.4.3.2.2: Red-shouldered hawk habitat at the scale of the project, district, and Nicolet landbase after change with shelterwood harvest treatments to only prep cuts**.**

Project Area	**Alt. 1**		**Alt. 2**		**Alt. 3**		**Alt. 4**	
Current Condition (2011)	8,664		8,664		8,664		8,664	
Following Implementation (2013)	8,657	-0.1%	5,484	-36.7%	5,706	-34.1%	7,942	-8.3%
Five years after Implementation (2018)	8,841	2.0%	6,884	-20.5%	7,106	-18.0%	8,356	-3.6%
Lakewood-Laona Ranger District	**Alt. 1**		**Alt. 2**		**Alt. 3**		**Alt. 4**	
Current Condition (2011)	139,255		139,255		139,255		139,255	
Following Implementation (2013)	139,033	-0.2%	135,860	-2.4%	136,082	-2.3%	138,318	-0.7%
Five years after Implementation (2018)	137,931	-1.0%	135,974	-2.4%	136,196	-2.2%	137,446	-1.3%
Nicolet National Forest	**Alt. 1**		**Alt. 2**		**Alt. 3**		**Alt. 4**	
Current Condition (2011)	260,697		260,697		260,697		260,697	
Following Implementation (2013)	257,005	-1.4%	257,005	-1.4%	257,227	-1.3%	259,463	-0.5%
Five years after Implementation (2018)	258,546	-0.8%	256,589	-1.6%	256,811	-1.5%	258,061	-1.0%

Despite the modified prescriptions described above, long-term reduction in suitable habitat for red-shouldered hawks would occur in the project area, consistent with forest plan MA direction for this area. By 2018, there would be a recovery and in growth of 1,216 acres of suitable habitat with Alternatives 2, and 3. Alternative 4 would have a recovery and in growth of 230 acres. At that time, there would be a reduction of suitable habitat 18-20 percent for Alternatives 2 and 3, and only four percent for Alternative 4. These reductions would result in limited opportunities for the project level red-shouldered hawk population to expand and establish new nesting territories in the area.

However, these are the consequences of restoring a Northern Dry Forest community and an extirpated barrens habitat. Both of these habitats historically existed prior to fire suppression activities and are not considered suitable woodland hawk habitat. The Northern Dry Forest community is considered rare (S3) in the state and has a global ranking of very rare (G3). The WDNR has identified this part of the district and project area as having a major opportunity to accomplish this goal (WDNR 2011).

Pine Barren communities are considered imperiled both globally (G2) and in the state of Wisconsin (S2) by the WDNR Natural Heritage Inventory program. Because many rare species of flora and fauna depend on barrens habitat, there is great concern that Pine Barrens habitats in Wisconsin be maintained or restored.

The forest plan also gives direction to restore and/or emulate natural disturbance regimes that were historically present within these currently existing pine communities (Objective 1.4b, c p. 1-3). This would be done through a combination of timber harvests and prescribed fire. The harvest treatments would change the current high-density forests in the area to variable-density conditions. Under planting and timber stand improvement activities would aid in the establishment of white pine and other desirable species (see under planting chart project file). The resulting habitat is not considered ideal habitat for red-shouldered hawks in the project area but the Species Viability Evaluation panel focused only on the Forest wide conservation measures for the species through the forest plans standards and guidelines and mainly through the allocation of MA 2B; this project does not contain any MA 2B areas.

All tree regeneration and release projects occur in stands that have harvest treatments. The tree release activities would occur in immature stands and therefore would not affect nesting habitat. The tree under planting work would provide for potential nesting habitat to develop in the long-term. Habitat for prey species would remain intact for short-term period in the release stands, but could gradually be reduced in the future with an open understory as the stand matures.

Biomass harvesting is proposed on 293 acres (3.4 percent) of suitable red-shouldered hawk habitat in Alternatives 2 and 3. All of these stands also have prescribed burns proposed in them after the completion of the harvest and biomass treatments. Although existing structural features such as very large downed logs, cavity trees, and snags would be retained in treated stands, the removal of smaller woody debris would ultimately result in less material on the forest floor in these stands as would be expected in a forest savanna environment. These activities could have an effect on some of the prey species of red-shouldered hawk in these stands by the removal of this cover, though there is little published or unpublished information on the impacts of tip wood or biomass harvest on wildlife species in Upper Great Lakes Region northern hardwood habitats. However, the impacts from these activities to the red-shouldered population would be minimal because it occurs only in about three percent of its available habitat and none of the stands have red-shouldered hawk nesting activity. Also, all these stands are being treated as part of the WUI program that is needed to protect private residential houses in the area from the potential wildland fires. Prescribed burns without biomass removal occur in additional 30 acres for Alternative 2 and 189 acres for Alternative 4. There are also acres that would act as firebreaks. As a result, these stands are unlikely to have fire move completely through them due to the lowland stands high moisture content. There are no red-shouldered hawk nests in these stands and as a result, no negative effects to the birds would occur.

Road management within red-shouldered hawk habitat would have the same results with all action alternatives in the following areas: 16.2 miles of decommissioned roads, 4.1 miles if open roads that would be closed, 20.1 miles of open roads that would stay open, 5.9 miles of motorized trail use. The only difference is with construction of roads that would then be closed after use; Alternatives 2 and 3 are .5 miles and Alternative 4 is .3. Road management activities would have no effect in all alternatives because they would not occur within the critical “no cut 30 acre” buffer surrounding the nest. There would also be a reduction in the amount of road miles in the red-shouldered hawk’s habitat across the project area which would then decrease vehicle traffic in that area reducing vehicle and human disturbance to the birds.

3.4.3.3 Cumulative effects

Alternative 1

In the absence of any direct or indirect effects, there can be no cumulative effects.

Determination:

No impact to red-shouldered hawks. No actions affecting red-shouldered hawks or their habitat would occur under this alternative; therefore, there would be no impacts to this species.

Action Alternative

By 2018, suitable habitat for red-shouldered hawks across the district would experience a small reduction. This reduction would occur mainly from the harvest treatments on the district within the McCaslin, Honey Creek-Padus, and Lakewood Southeast project areas. This trend of limited reduction in habitat is also seen at the Nicolet National Forest (NNF) scale. The action alternatives would be between -1.0 and -1.6 percent. An early downward trend with a slight increase is evident in the future during the period between 2016 and 2021. This decrease is largely due to the long-term loss of oak and some hardwoods on each ranger district landbase. On the NNF, approximately 1,300 acres of combined mature oak and hardwood is lost long-term because of impacts from the 2007 Quad County Tornado event and oak wilt disease since 2004.

A review at the CNNF level also shows loss of habitat until about 2016. There is a decrease of several thousand acres from hardwood management on the Medford-Park Falls Ranger District and about 1,600 acres of oak harvests on the Washburn Ranger District (WRD). The oak management on the WRD includes about 700 acres that would be converted to Pine Barrens habitat. Most of the remaining 900 acres is over mature and in decline, and would require an even-aged regeneration harvest treatment in order to maintain this type on the CNNF. The loss of oak was anticipated during forest plan development since 96 percent of the oak component is over 70 years old. However, these reductions are occurring over a small period of time with increase occurring afterwards that would re-establish that habitat close to those at the current levels. Following 2016, there is an increase in red-shouldered hawk habitat for six years in which those acres return near the current levels of the CNNF (-0.6 percent).

On non-FS lands inside and adjacent to the project area, there are about 4,300 acres of habitat that may be suitable to red-shouldered hawks. Assuming that the age structure of the northern hardwoods forested acres (3,327 acres) is similar to the hardwoods on FS land, most of those acres are suitable now. In the past 10 years there has been 119 acres (three percent) of timber harvest in suitable habitat on state and private lands enrolled in the Managed Forest Land program (MFL), 102 acres was clearcut and thus made unsuitable for 50 years and 17 acres was thinned which is a short-term loss of five years. Over the next 10 years, timber harvests throughout the same land base would involve 396 acres (eight percent). Most is scheduled to be clearcuts (306 acres) that would make those stands unsuitable long-term and 90 acres would be thinned making them unsuitable for five years. For the other suitable habitat on lands with harvest information, we would assume a 15-year re-entry cycle for the northern hardwoods that are evenly distributed among the years since their last harvest. Approximately 200 acres of that habitat would be selectively harvested in any given year and the treatments would make that habitat unsuitable for a period of five years at most, if at all. The result is approximately 93 percent of the other ownership land hardwoods (2,820 acres) are assumed available to nesting

red-shouldered hawks in any given year. As a result, there are almost 4,000 acres of long-term suitable habitat on non-FS lands to add to those on CNNF within the project area.

Determination:
The determination is may impact individuals but not likely to cause a trend to federal listing or loss of viability. At the project level, there would be a loss of suitable habitat but the core use areas would be maintained that have most of the red-shouldered hawk nesting activity. Across the Nicolet National Forest (NNF) area, all alternatives result in small decrease (approximately 1.5 percent) in the amount habitat by the year 2018. However, these decreases are a small amount of the available habitat across the district and NNF. Further, nearly 4,000 acres of additional habitat exists on non-FS lands within the project area. Regardless of which action alternative is selected, the total amount of available habitat to red-shouldered hawks on the NNF would be abundant in 2018 (255,554 - 257,953 acres) and at the district level (134,939 – 137,338 acres).

3.4.4 Black-backed Woodpecker

Threshold
In the SVE process for the forest plan FEIS, no minimum numbers of black-backed woodpecker or its habitat were identified. However, reserve tree guidelines, emphasis on retention of conifers in upland/lowland transition zones, salvage deferral, and the stability of the majority of the species habitat (lowland conifers) under the revised forest plan were expected to maintain the viability of the species.

3.4.4.1 Affected Environment

Black-backed woodpeckers have not been documented in the project area. The NNF breeding bird survey has documented only two observations since 1987 on the district and those were approximately 13 miles north of the project area. All suitable habitats (181 acres) with proposed harvest treatments were surveyed in 2010 and no birds were recorded.

3.4.4.2 Environmental Consequences

Two spatial scales were used to evaluate meaningful effects to black-backed woodpecker. For evaluating direct and indirect effects to the species, the project area was used. Black-backed woodpeckers nesting or foraging within the project area have the potential to be directly (destruction of nest tree) or indirectly (loss of foraging habitat) affected by the proposed activities. Cumulative effects to black-backed woodpeckers were analyzed at the scale of the project area and at the scale of the entire CNNF. Such a large analysis area is appropriate because 1) little is known about the population biology of the species, 2) the species is highly mobile, and 3) based on the ephemeral nature of its habitat, black-backed woodpecker abundance is likely related to resource availability at the landscape or regional scale.

The temporal scale of the cumulative effects analysis includes actions that have occurred over the past 3 years and those that are reasonably foreseeable. Three years after a tree dies, the suitability of dead conifer stands or individual trees is greatly diminished because the snags no longer harbor abundant insects on which to forage.

Direct and indirect effects

Alternative 1

No actions would occur within the project area under the Lakewood Southeast EIS. However, past decisions would be implemented which include two stands for spruce decline salvage harvests. Upland conifer stands that are decadent now would remain so and would eventually convert to another forest types. As the trees die, they may be utilized by black-backed woodpeckers. Lowland conifer forest would remain habitat for the species for the foreseeable future.

In the project area, some diseased stands have been harvested or are scheduled for treatment under salvage sales. Generally, these stands are no longer suitable habitat because they have been dead for more than 3-4 years.

Action alternatives

Clearcutting, thinning or special cut treatments would remove most of the dead conifer component, except for reserved areas. The project area contains about 5,408 acres of suitable habitat, of which 5,228 acres (97 percent) is lowland conifer and would not be treated. Under Alternative 2 and 3, a loss of 188 acres of suitable habitat amounts to only three percent of available habitat and similarly under Alternative 4, a loss of 110 acres results in a loss of about two percent of suitable habitat.

Black-backed woodpecker may also find conifer snags that provide some resources to them scattered throughout other forested stands in the project area. For example white pine, red pine, tamarack, or balsam fir is a stand component, that are used at times, but the density of resident black-backed woodpeckers are generally low. Individual birds could be impacted if trees are harvested during the nesting season (typically May – June), but foraging impacts and impacts to the population as a whole, are unlikely given the abundance of habitat available.

Road management within black-backed woodpecker habitat would have the same results with all action alternatives. There would be no effect from any alternative's road management activities due to the limited amount of this work occurring in black-backed woodpecker habitat. Also, black-backed woodpeckers do not avoid road edges, openings or open corridors and have been observed either foraging or nesting in or near such areas.

Impacts from prescribed fire and biomass removal projects are not expected to have negative effects to this species. Prescribed fire and biomass removal are proposed together within 33 acres of suitable habitat for all alternatives, as well as fire breaks. While removal of dead and down conifer, for biomass harvest could reduce foraging habitat, there remains an abundance of standing dead and down in both reserved areas and untreated units across the district and CNNF. There could also be a positive impact from the prescribed fires due to some trees may die producing foraging habitat for the birds in those stands.

3.4.4.3 Cumulative effects

Alternative 1

Losses of mature upland black-backed woodpecker habitat because of No Action Alternative would occur over a period of decades as stands break up. During break-up, the conifer stands are

likely to be used by this species, and individual dead or dying trees are used for a short time while insects remain present. Presently in the project area, there are about 809 acres of upland spruce older than 60 years, and about 175 acres of jack pine, which could provide habitat in the future. Under this alternative, these habitats would likely convert to other types such as hardwood, or a mix of spruce, balsam fir, red, white, and jack pine and may or may not provide black-backed habitat in the future. Regardless, abundant habitat remains available in other preferred forest types, especially lowland conifer.
Determination: No Impact.

Action alternatives
By 2018, suitable habitat across the district would experience a small reduction. This reduction would be less than one percent and occur mainly from jack pine harvest treatments on the district within the McCaslin, Boulder, and Flower Lake project areas. This trend of limited reduction in habitat is also seen at the NNF scale. The action alternatives would be a loss of about one percent. At the NNF level, from 2011 to 2018 there is a small and slow decline of habitat that is largely due to the harvest of mature jack pine. Most of those treatments are occurring within the Long Rail, Fishel, Northwest Howell, and Phelps projects on the Eagle River- Florence Ranger District. However, there remains abundant habitat both at the project level and at the larger scales of the district and CNNF levels, even though the amount of acreage of suitable habitat declines.

On non-FS lands inside and adjacent to the project area, there are about 3,050 acres of habitat that may be suitable for blacked backed woodpeckers. There has been no timber harvest activities in the last 10 years within the bird's habitat on state and private lands enrolled in the MFL program. In the next 10 years on these lands there is a total of 132 acres (four percent) harvest treatments. There would be about 28 acres of clearcuts and 105 acres of over mature tree harvest treatments that would make those lands unsuitable for 60 years. There are also about 63 acres being thinned and 186 acres having selective harvest that would make these stands less than ideal but would still have some habitat components that would be beneficial to these birds.

No negative effects to black-backed woodpeckers or their habitat is expected because of implementation of the action alternatives. The loss of habitat for the black-backed woodpecker is less than or equal to one percent at the district and NNF levels but there is ample suitable habitat available at those levels and also on non-FS lands in and around the project area.

Determination: No Impact

3.4.5 Connecticut Warbler

Threshold
In the species viability evaluation process for the forest plan revision (Schenck et al 2004), no minimum numbers of Connecticut warbler or acres of habitat were identified. The selected alternative resulted in standards and guidelines protecting the species and maintenance of the jack pine forest type by harvesting jack pine in blocks of 100 acres or more. No management would occur in mature lowland conifer habitat where this species is most abundant.

3.4.5.1 Affected Environment

There are approximately 19 occurrences recorded from the Nicolet National Forest Breeding Bird Survey at 16 sites (Nicolet Breeding Bird Surveys 1987–2010), but no birds have been confirmed at survey points since 2007. There are 9,218 acres of suitable Connecticut warbler habitat in the project area.

3.4.5.2 Environmental Consequences

Two spatial scales were used to evaluate meaningful effects to Connecticut warbler. For evaluating direct and indirect effects to the species, the project area was used. Connecticut warblers nesting or foraging within the project area have the potential to be directly (destruction of nests) or indirectly (loss of nesting or foraging habitat) affected by the proposed activities. Cumulative effects to this species are analyzed at the scale of the project area. If appropriate, analysis may go up to the scale of the CNNF. This analysis area is appropriate because (1) little is known about the population biology of the species, (2) the species occurs at low densities (relatively few observations reported), and (3) based on the availability and abundance of jack pine and lowland conifer habitat, its abundance is likely related to the availability of these types at the larger scale.

The temporal scale of the cumulative effects analysis includes actions that have occurred over the past five years and those that are reasonably foreseeable and specific to suitable habitat. Actions within the last five years may not have been incorporated into the Forest Service vegetation database and were tracked separate from older past actions, the effects of which are assumed to be manifested in current conditions (as represented in the vegetation database).

Direct and indirect effects

Alternative 1

There would be no direct, indirect, or cumulative effects to Connecticut warblers or their habitat. No vegetation or other management would occur with this alternative under this project. Existing available habitat and conditions for Connecticut warblers would remain the same.

Action alternatives

Under Alternative 2, there would only be 558 acres of this habitat harvested by either clearcut or removal harvest. After harvest, 216 acres would be converted to other forest types not considered suitable habitat for this species. However, there would be 58 acres replanted back to jack pine, which would become favorable habitat after 30 years. There would also be 284 acres converted to either pine/oak or red oak, which are not considered suitable but may have small components of suitability within them.

Under Alternative 3, there would only be 512 acres harvested and 96 acres of this would be replanted to jack pine. There would be 253 acres converted to either pine/oak or red oak, which are not considered suitable. However, they may contain small components of suitable within them). The remaining 163 acres would be converted to other habitat types not considered suitable.

Under Alternative 4, there would only be 480 acres harvested with 138 acres converted to other forest types not considered suitable habitat for this species. There would also be 284 acres

converted to either pine/oak or red oak, which is not considered suitable. However, they may contain small components of suitable within them. Immediately after harvest in 2013, the action alternatives would result in a habitat loss. By 2018, there would be an in-growth of suitable habitat within the project area of 361 acres. That would result in a loss of about only one percent for all action alternatives. Impacts to Connecticut warbler would not occur because there were no birds detected during project surveys and approximately 8,700 acres of suitable habitat does not have proposed harvest treatments.

Also under all action alternatives in suitable habitat are fuels treatments, which include 270 acres of potential biomass harvest. The fuels treatment would remove understory brush and ladder fuels in portions of seven stands (191 acres) that are not otherwise treated for clearcut harvest. These partially treated stands would still provide habitat for this species of warbler. Prescribed fire is planned in only one stand of 11 acres that has no harvest treatment. The habitat would remain unsuitable for several years until a shrub layer is developed. No birds were detected in this stand and as result, no negative effects from this activity would occur.

Road management within Connecticut warbler habitat would have the same results with all action alternatives. The only difference is with construction of roads that would then be closed after use; Alternative 2 and 3 are .1 miles and Alternative 4 is .08. There would be no effect from any alternative's road management activities due to the limited amount of this work occurring in this warbler's habitat.

3.4.5.3 Cumulative effects

Alternative 1

Determination: No Impact.

Action alternatives

At the district level, Connecticut warbler habitat decreases at very small percentages (< 0.6 percent) for all alternatives in 2013 and essentially stays unchanged in 2018. It is important to note that 30+ year old jack pine would only provide habitat for a limited time because jack pine is an early successional species that naturally regenerates after fire events or clear-cut harvest. Without disturbance jack pine forest would most likely convert to other longer-lived forest types, which may or may not provide suitable habitat for this species. At the scale of the NNF for all alternatives, suitable habitat also stays unchanged in 2018 (- .1 percent). This is due to the in growth of jack pine habitat becoming suitable throughout the NNF that then off sets those acres of harvested stands.

On non-FS lands inside and adjacent to the project area, there are about 1,035 acres of habitat that may be suitable for Connecticut warblers. In the past 10 years, there has been no timber harvest activities within the bird's habitat on state and private lands enrolled in the MFL program. In the next 10 years on these lands, there are 101 acres (nine percent) of clearcut planned, 67 acres in mature jack pine and 34 acres in low land conifer habitat that would make those lands unsuitable for 60 years. There are also about 34 acres of jack pine and 63 acres of low land habitat with planned thinning (nine percent) which would make these stands unsuitable for five years. About 300 acres of low land conifer would have selection harvests and thus no negative effects to the habitat would occur.

No negative effects to Connecticut warbler or their habitat is expected because of implementation of any action alternatives. The loss of habitat for the warbler is less than or equal to one percent at the district and NNF levels but there is ample suitable habitat available at those levels and on non-FS lands in and around the project area.

Determination: No Impact. Habitat does decline following treatments within the project area (three to four percent) and at very small amounts at the district and NNF levels (zero to .6 percent). However, there are large amounts of suitable habitat at all levels of CNNF and non-FS lands that do not receive treatment and would be still available.

3.4.6 American Marten

3.4.6.1 Affected Environment

During the winters 2004-2005 and 2008-2009, the USDA Northern Research Center and FS conducted hair snare surveys on district to assess occupancy and if found, the genetic relationships of marten in northern Wisconsin (Williams, B. W. and K. T. Scribner 2006). Survey blocks were determined by GIS analysis that selected the highest likelihood of occurrence by marten based on habitat conditions. The two areas selected were along FS road 2123 (Diamond Roof) and 2131 (Catwillow); no marten were recorded. The project area has habitat but it was identified as having low potential (0-10 percent) of being suitable for pine marten occupancy (Zoller 2004). For those reasons there was no detailed analysis completed for American marten for this project.

3.4.6.2 Environmental Consequences

Determination: No Impact. There are no reports of American marten in the project area. The potential for occurrence of this species in the project area is extremely low due to poor habitat and this area is about 40 miles south of the nearest documented marten observations on the district. Marten have displayed only limited dispersal since their reintroduction on the Eagle River Ranger District (45 miles north of project area) and the maximum distance a marten has been recorded to disperse from its home range is approximately 15 miles (Eklund 2009).

3.4.7 Bats

Methods

The most recent acoustic transects and/or mist net surveys conducted in the project area occurred in August 2011. Mist netting surveys were completed on August 4 and two species of bat were captured: big and little brown bats. Acoustic recordings were conducted on approximately 35 miles of roads within and adjacent to the project area.

3.4.7.1 Affected Environment

The little brown myotis (LBM), northern long-eared myotis (NLE) and tri-colored bat (TCB) were recently added to the updated CNNF's RFSS list due primarily to concerns over White-Nose Syndrome (WNS) and not because of current scarcity or viability concerns on the CNNF. The three RFSS bats have been listed Region-wide as a proactive measure due to their vulnerability to WNS.

Currently, WNS has not been documented in any hibernacula in the upper Midwest, and the CNNF continues to provide essential summer roosting and foraging habitat.

Eight bat species, accounting for approximately 12 percent of the state's mammal diversity, have been recorded in Wisconsin: which include the big brown bat, silver-haired bat, eastern red bat, hoary bat, LBM, NLE, TCB, and the Indiana bat, which has not been found in Wisconsin since the 1950s. Of these species, all have been documented on the CNNF, excluding the Indiana bat.

3.4.7.2 Environmental Consequences

Direct and indirect effects

Alternative 1

There are approximately 10,939 acres of potentially suitable foraging habitat and approximately 6,640 acres of potentially suitable roosting habitat for these species across the project area. The result of not implementing the proposed activities would be the passive maintenance or enhancement of habitat for the species. This would occur as some of the older stands gradually become decadent, increasing the number of snags, and dead wood available for roosting. This uncertain use is speculative, so any changes in the condition of stands in the project area would not be possible to quantify and are not likely to have a discernible effect on the little brown, northern myotis or tri-colored bat. Also, since snags are not currently limiting the species in the project area, there would be no indirect effects from this alternative. Since there are no direct or indirect effects, there would also be no cumulative effects on RFSS bats or their habitat.

Action alternatives

Within the project area, there are approximately 10,939 acres of foraging habitat for bats. Proposed treatments within summer foraging habitat vary by alternative and affected acres depending on the alternative.

Forest management practices that create small forest openings may foster development of suitable foraging habitat and may even enhance roosts located along forest gaps and edges. Smaller harvest areas increase edge habitat per unit area, promoting plant and insect diversity that is beneficial to bats and other wildlife. However, some bat species cannot forage in the middle of large (at least 120 acres) regenerating stands. Roost-tree loss should be minimized when creating openings so that the loss of roosts does not offset the benefits of increased foraging habitat.

Majorities of the treatments are even-aged methods and can alter roosting and foraging habitat with both negative and beneficial effects. In the short-term, even-aged methods can reduce canopy cover, which can reduce suitable foraging conditions in large openings for up to 50-70 years after entry, but the size of harvests are limited by forest plan's standards and guidelines, and forest bats are known to use forested edge habitats for foraging. Flight corridors can also be maintained through early successional patches by tying together leave-trees and protected filterstrips around streams. Residual trees in the resulting open condition of an even-aged harvest are also subject to increased solar radiation, which increases the suitability of any given tree to becoming a suitable bat roost tree.

In the long-term, even-aged methods are considered beneficial for the RFSS bats as suitable foraging and roosting habitat, depending on age class and eventual structure. Long rotation periods can also help ensure that mature forest stands would be available into the future. Some of the reserve trees required in many proposed actions are retained for future growth. They can potentially create large maternity-grade snags when they die. New herbaceous or herbaceous/shrub openings are sometimes created through these harvest treatments. Minimal or no adverse effects can be expected from the small-scale conversion of favored forested habitat to open habitat. Additionally, any planned future maintenance of these openings would provide long-term foraging and roosting opportunities to RFSS bats. It would provide small-scale forested edge habitat, contributing to a diversity of habitat types, which aids insect prey production, and allowing increased solar radiation to reach residual and edge trees. Thinning would benefit bats by increasing flight space in the stand and sunlight to the stand floor, which increases herbaceous growth for bats' insect prey. Trees left on-site provide some mature forest structure in the form of snags and green trees.

The selection cuts of the treatments proposed in bat summer foraging habitat within the project area are designed to establish an uneven-aged structure. This type of harvest treatment maintains diverse forest structure and roost trees, while creating small gaps, enhancing edge habitat for foraging, promoting diverse vegetation structure, and some increases in herbaceous vegetation, favorable to production of bats' insect prey.

About 14-43 percent (depending on the alternative) of the summer foraging habitat for bats would receive some harvest treatment. However, the built-in project's standards, guidelines, and vegetation prescriptions are anticipated to minimize any direct or indirect impacts to foraging habitat. In general, the standards and guidelines would contribute to a landscape that is species-rich, diverse, robust, and contains a healthy forest system that can provide for a wide range of wildlife and plant species needs. Although anticipated effects of each management action may vary somewhat by bat species, by adhering to the standards and guidelines, the overall effects of a particular project or action are likely to be beneficial to the little brown, northern long-eared, and tri-colored bats.

Indirect impacts to summer roosting habitat:
A direct impact on bats and summer roosting habitat may occur if an occupied roosting tree is removed. However, there is a low probability of this occurring due to dead or dying trees are not typically part of harvest prescriptions. Bats do establish more than one roost tree in the same patch of forest and these would be available for use. Shelterwood cuts that would open up the canopy allowing increased sun light (heat) on existing trees enhancing roosting habitat. Project's standards and guidelines address many of these issues of future roosting in reserve tree criteria.

While the proposed project has the potential to affect 18-64 percent of the summer roosting habitat, many of the project's standards and guidelines address current retention of snags and future creation of snags for summer roosting trees. While individual summer roost trees may be harvested, which may possibly affecting some bats and habitat, it is anticipated that the remaining trees in a similar patch of forest would provide adequate opportunities to roost.

Road management activities have the potential for direct and indirect effects to RFSS bats through the removal of suitable roost trees and temporary alteration of foraging habitat, which are both discussed in the above section related to harvest treatments. The primary difference here is that in certain circumstances connected actions have a higher likelihood of permanently removing undetected occupied roost trees due to less flexibility in the placement of these features on the landscape because of requirements to protect non-biological resources (e.g., steep slopes and erodible soils) and to meet other needs, such as engineering considerations. Conversely, these activities, particularly temporary skid road/trail construction, can also create beneficial conditions for foraging bats. The temporary skid roads and trails are typically narrow and linear, and the forest canopy is usually retained or partially retained. RFSS bats are known to exploit linear habitat features, such as roads, trails, streams, and forest edges as travel corridors and foraging habitat, especially if water sources are located nearby ((USDI Fish and Widlife Service 2007). Log landings may provide relatively small canopy openings that would be suitable for foraging or increase solar radiation to potential roost trees along the edge. These activities would open the canopy and understory, thereby moving localized conditions closer to that of optimal foraging habitat. Typically after activities are complete, these landings and temporary roads are closed off to vehicular travel and left to revert to a forested state. Generally, the temporary, short-term loss of this habitat is small in comparison to the adjacent forested landscape, and is further minimized by the creation of flight corridors and the long-term enhancement of roosting and foraging habitat. Road management within bat foraging and roosting habitat would have the same results with all action alternatives in the following areas: 20.3 mile of decommissioned roads, 4.65 miles if open roads that would be closed, 33.4 miles of open roads that would stay open, and 8.25 miles of motorized trail use. The differences occur with miles of construction of roads that would then be closed; Alternative 2 is .7 miles, Alternative 3 is .5 miles, and Alternative 4 is .3 miles. There would be no effect from any alternative's road management activities due to the limited amount of this work occurring bat habitat.

Biomass treatments occur within 892 acres of suitable foraging and roosting habitat. There would be no effect to bat roosting habitat because no large dead or live trees would be removed from the stand. Vertical foraging habitat would be maintained throughout the stand; however, ground level horizontal habitat would be reduced. The vegetation material being removed from the forest ground floor could be considered a source of insect habitat and thus a food source for the bats. However, the effect to the bats insect population would be very minimal due to only 8 percent of the foraging habitat is having potential biomass treatments and there is abundant insect habitat at the mid and upper forest canopy levels were most bats conduct their foraging behavior.

On non-FS lands inside and adjacent to the project area, there are about 4,700 acres of habitat that may be suitable to the three RFSS bats. Assuming that the age structure of the northern hardwoods forested acres (3,327 acres) is similar to the hardwoods on FS land, most of those acres are suitable now. In the past 10 years, there has been 187 acres (four percent) of harvested timber in suitable habitat on state and private lands enrolled in the MFL program. About 179 was clearcut and 8 acres had overstory removal that made those stands unsuitable long-term for roosting habitat but the open habitat would be good foraging areas. Over the next 10 years, timber harvests throughout the same land base would involve 1,629 acres. There is 375 acres with selection cuts that would have little or no effect on bats or their habitat. Most is scheduled

to be clearcuts (1,072 acres or 23 percent) that would make those stands unsuitable long-term for roosting habitat. There would also be 83 acres (1.7 percent) thinned and 84 acres with overstory removal. For the other suitable habitat on lands with harvest information, we would assume that the 15-year re-entry cycle for the northern hardwoods that they are evenly distributed among the years since their last harvest. Approximately 200 acres of that habitat would be selectively harvested in any given year and the treatments would make that habitat unsuitable for a period of five years at most if at all. The result is approximately 93 percent of the other ownership land hardwoods (2,820 acres) are assumed to be available to bats in any given year. These acres of habitat add to the abundance of suitable habitat on Forest Service land.

3.4.7.3 Cumulative effects

Alternative 1

Determination: No impact.

Action alternatives

On non-FS lands inside and adjacent to the project area, there are about 4,700 acres of habitat that may be suitable to the three RFSS bats. Assuming that the age structure of the northern hardwoods forested acres (3,327 acres) is similar to the hardwoods on FS land, most of those acres are suitable now. In the past 10 years there has been 187acres (four percent) of harvested timber in suitable habitat on state and private lands enrolled in the MFL program. About 179 was clearcut and 8 acres had overstory removal that made those stands unsuitable long-term for roosting habitat but the open habitat would be good foraging areas. Over the next 10 years, timber harvests throughout the same land base would involve 1,629 acres. There is 375 acres with selection cuts that would have little or no effect on bats or their habitat. Most is scheduled to be clearcuts (1,072 acres or 23 percent) that would make those stands unsuitable long-term for roosting habitat. There would also be 83 acres (1.7 percent) thinned and 84 acres with overstory removal. For the other suitable habitat on lands with harvest information, we would assume that the 15-year re-entry cycle for the northern hardwoods that they are evenly distributed among the years since their last harvest. Approximately 200 acres of that habitat would be selectively harvested in any given year and the treatments would make that habitat unsuitable for a period of five years at most, if at all. The result is approximately 93 percent of the other ownership land hardwoods (2,820 acres) are assumed to be available to bats in any given year. These acres of habitat add to the abundance of suitable habitat on the CNNF.

Determination:

May impact individuals but not likely to cause a trend to federal listing or loss of viability. Direct or indirect impacts to the summer foraging and summer roosting habitat for the little brown myotis, northern myotis or the tri-colored bat by the proposed project may occur. While individual summer roosting trees or trees for maternity colonies may be removed during harvest treatments, bats would have suitable roosting habitat within or near the same location that can be utilized. Since roost switching is common and expected among these bat species, there is a high probability that with implementation of project guidelines for reserved trees, suitable roosting trees would be found. There is also a large quantity of suitable foraging and roosting habitat in and outside the project area on the CNNF and non-FS lands.

The recent RFSS listing of these three bat species did not occur because of current population declines or viability concerns on the CNNF or in the state of Wisconsin.

3.4.8 Plants

Methods

Rare plant species inventory on the NNF landbase formally began in the early1980s, with a contract for rare plant inventory through the WDNR. There was very limited additional formal inventory of plants, rare or otherwise, until 1994. Since then, the CNNF has cataloged 53 rare plant species formally listed as RFSS, occurring in over 2,000 sites. The CNNF now actively inventories for rare plants on all suitable lands with planned activities.

A pre-field review of the analysis area was conducted to identify currently known rare plant locations, and potential survey needs based on suitable habitat and possible effects from proposed actions. A GIS computer analysis was used incorporating spatial information from previously known rare plant sites, soils, habitat types, and overstory cover types. Also considered were information from the Wisconsin Natural Heritage Inventory and the University of Wisconsin-Steven Point Robert W. Freckmann Herbarium.

3.4.8.1 Affected Environment

The pre-field screening identified known occurrences of eight RFSS listed plants species within the project area. Localized surveys have been conducted sporadically throughout the project area since the early 1980s and surveys for this project were conducted during the 2009, 2010, and 2011 field seasons. While Round-leaved orchis, Missouri rock cress, Blunt-lobed grapefern, Rocky Mountain sedge, Northern bog sedge, Many-headed sedge, Ram's head lady's slipper, and butternut, were targeted for survey, all plant species listed on the CNNF RFSS and Likely to Occur Regional Forester Sensitive Species lists are considered.

Missouri rock cress is known in six locations in the project area. There is one known location of Blunt-lobed grapefern, discovered in 2008. There are two known locations of Rocky mountain sedge on the CNNF and both are within the project area. Northern bog sedge was observed at one location in the project area in 1982 and has not been observed at this site since it was originally found, but the habitat is still suitable. Many-headed sedge has not been observed in the project area since it was originally located on private property in 1983. There is one known location of Ram's head lady's slipper in the project area, discovered in 1982 and last observed in 2012. Butternut has been observed in the project area mostly as scattered individuals.

3.4.8.2 Environmental consequences

The spatial scale for evaluating effects to plant species is the project area. Rare plant species have limited dispersal ability, and no negative effects are anticipated from project activities, so there is no need to consider lands beyond the project boundary.

The temporal scale for evaluating effects to plant species is the period of on-the-ground project activities. Because there would be no negative effects from project activities for all eight-plant species, and two species would experience beneficial effects from prescribed burning, there is no need to consider time beyond the period of project activities.

Alternative 1

For Alternative 1, the no action alternative, there would be no direct, indirect, or cumulative effects to these plants or their habitats. No vegetation or other management activities would occur and existing habitat and conditions would remain the same.

Action alternatives

Small round-leaved orchis could potentially be found in locations in the project area, suitable habitat is not actively managed on the forest, and thus there would be no direct or indirect effects from federal actions; therefore no cumulative effects.

Rock outcrop areas provide the best habitat for Missouri rock cress; therefore, it is unlikely to be affected by timber harvest, because of difficult access and the general lack of commercial timber. At all known sites, the habitat is likely to remain suitable for Missouri rock cress. There may be suitable habitat in areas proposed for prescribed burning. Allowing prescribed fire to burn over rock outcrops would increase habitat suitability primarily by helping control shading vegetation. No direct or indirect effects are anticipated from timber harvest, and only beneficial effects are anticipated from prescribed burning; therefore, there would be no cumulative effects.

Blunt-lobed grapefern is along shoreline habitats, which are protected from potential activity impacts by BMPs for water quality. Other plants could potentially be found in the project areas similar suitable habitat would be protected by BMPs and thus there would be no direct or indirect effects from federal actions; therefore, there would be no cumulative effects.

Rock outcrop areas that provide the best habitat for rocky mountain sedge are unlikely to be affected. There may be suitable habitat in areas proposed for prescribed burning. Allowing prescribed fire to burn over rock outcrops would increase habitat suitability primarily by helping control shading vegetation. No direct or indirect effects are anticipated from timber harvest, and only beneficial effects are anticipated from prescribed burning; therefore, there would be no cumulative effects.

Northern bog sedge's typical habitat is primarily openings in sphagnum-rich cedar, spruce, or tamarack swamps. Forested wetlands such as this are not actively managed on the CNNF. This plant could potentially be found in other locations in the project area, but as noted above, suitable habitat is not actively managed on the forest and thus there would be no direct or indirect effects from federal actions; therefore, no cumulative effects.

Many-headed sedge could potentially be found in other locations in the project area, similar suitable habitat would be protected by BMPs and thus there would be no direct or indirect effects from federal actions; therefore, there would be no cumulative effects.

Ram's head lady's slipper is known in forested wetlands. This plant could potentially be found in other locations in the project area, but as noted above, suitable habitat is not actively managed on the CNNF and thus there would be no direct or indirect effects from federal actions, and therefore there would be no cumulative effects.

Butternut has been observed in the project area mostly as scattered individuals. It is found throughout Wisconsin except for the northern-most tier of counties and is found growing on rich, loamy, well-drained soils as well as on drier, rocky soils when associated with limestone. Although rarely a common tree, it was found in a number of different forest types and could be locally abundant. Butternut's range has been under severe contraction since the 1960's due to a fatal fungus that forms multiple branch and stem cankers. The project would follow forest plan guidelines to protect butternut seed sources. Timber harvest around butternut trees would be beneficial by providing regeneration opportunities, but the canker disease would continue to cause mortality to individual trees.

3.4.9 Cumulative Effects used for all species

There were 19 vegetation management projects that were considered for the cumulative effects analysis in this BE (Table 3.4.9). However, not all projects were considered for every species because some species suitable habitat was not in the project area or was not affected by project activities.

Table 3.4.9: Past, present, and reasonably foreseeable future vegetation management activities that were considered in the cumulative effects analysis.

Project Name	Landbase	Project Name	Landbase
Boulder Vegetation Management	LKLA	Fishel Vegetation Mgmt.	ERFL
McCaslin Vegetation Management	LKLA	Argonne EIS	ERFL
Flower Lake HFRA	LKLA	Grub Hoe Vegetation Mgmt.	ERFL
Honey Creek / Padus Project	LKLA	Northwest Howell Vegetation Mgmt.	ERFL
Blackwell Blowdown	LKLA	Long Rail Vegetation Mgmt.	ERFL
Lakewood Southeast Project	LKLA	Phelps Vegetation Mgmt.	ERFL
Quad County Tornado Salvage	LKLA	Early Successional Habitat Improvement Vegetation Mgmt.	CNNF
Hardwood Biomass	LKLA	Spruce Decline II	CNNF
Lakewood-Laona Plantation Thinning	LKLA	Spruce Decline II EA	CNNF
Wabeno Blowdown Salvage	LKLA		

3.5 Fire

History

Prior to modern settlement, fire played two important roles in these pine-dominated communities. One was relatively low-intensity surface fires that burned at intervals of approximately 5-40 years, although these intervals could have been shorter or longer. These types of fires usually left the over-story intact or created small punch holes in the canopy of the forest while maintaining a low growing understory. Over time an uneven-aged forest structure would develop. The second role of fire played was under certain weather conditions, the surface fire would transition into the crowns and become a stand replacing fire. Fire intervals for this type of event were short at every 10-70 years. Jack pine regenerates very well under this type of fire regime due to serotinous

cones (seeds are released due to heat from a fire) which are prolific seeders after fire. Seedling densities of 2,000-5,000 seedlings per acre are common after a stand-replacing event.

3.5.1 Affected Environment

The treatment units consist of pine and pine-hardwood dominated vegetation communities that include jack pine, red pine, northern pin oak, and quaking aspen. The Lakewood Southeast area, (in particular the Airport Road area), is a high concern area on the CNNF for a catastrophic wildfire within the wildland-urban interface (WUI). A recent study of the district land base showed the Township of Mountain as one of the largest and most at-risk wildland urban interface areas on the district. This is due to the hazardous fuel types occurring in the area and the rapid growth of residences and summer homes. Also supporting this a statewide assessment of communities at-risk from wildfires, the Township of Mountain is considered a community at high risk of incurring damage to property and resources, or even loss of life, from wildland fire.

During the 20th century, fire exclusion in the area greatly reduced wildfire occurrences. This factor, combined with the fact that jack pine becomes very susceptible to insects, disease, and natural senescence after 60 to 80 years of age, has generated an increased fuel load both on the forest floor and in ladder fuels. This fuel accumulation creates the potential for wildfires with increased magnitude and extent that are difficult and dangerous to control.

Wildfire Risk

Risk is the probability of having an ignition becoming a fire in a given area. The treatment area is near the Trans Canada Gas pipeline corridor that is located along the eastern boundary of the project area. The pipeline is a corridor void of trees that has a two-track road in most upland areas that is an avenue for many people to access forest lands via off highway vehicles. Unregulated camping is also very popular along the pipeline and has been a source of wildfire ignitions. In addition to the Trans Canada pipeline, the continued growth in the area poses an increasing problem as the WUI continues to expand not only in size, but in risk of personal safety to the population as well. Many of the structures that adjoin federal lands along Airport Road have no defensible space and even a small wildfire could have catastrophic consequences as far as injury/loss of life and loss of property. Because of this, the federal lands that border private property are of primary concern for federal land managers.

Ignition comes from two sources: human caused and lightning. From 1987-2009, 67 fires started in the project area, with an average of three fires per year. Of these fires, one was lightning caused and 66 were human caused. The largest fire in recent history in this area occurred in 2006 and was eleven acres.

Wildfire Hazard

Wildfire hazard is defined as those conditions that promote the spread and intensity of fire and the difficulty of suppression. Fuel accumulations, continuity of fuel beds, presence of ladder fuels, proportion of dead fuels, and landscape-level fuel patterns contribute to the final size and severity of wildfires. Other environmental conditions, including wind, fuel moisture, and topography greatly influences the spread and intensity of wildfire. Of the conditions, which influence fire behavior, fuel characteristics are the only ones, which can be managed. Excessive accumulations of fuel lead to increased intensity and severity of fires.

The project area's fuel loading is variable depending upon stand type and treatment history. Some of the area has been treated with various silvicultural treatments throughout the past century. Dead and downed fuel loading ranges from 9.58 to 13.65 tons/acre (Ottmar 2002).

Many timber stands with fuel hazards in the Lakewood Southeast Project Area WUI are overstocked and in an unhealthy condition, which can fuel catastrophic fire. The timber stands proposed for treatment within the WUI have the potential to be converted to forest types with lower potential for catastrophic fire. This need is based upon forest plan goal 1.4a (forest plan, p. 1-3), and agency-wide goals to provide healthy forest conditions described in the Healthy Forest Restoration Act 2003 and the National Forest Management Act of 1976.

Firefighter Safety

Wildfire suppression operations are conducted in a high-risk environment. All personnel involved in suppression operations are subject to the dangers of entrapment, vehicle and aircraft accidents, and medical emergencies.

For efficient and effective wildfire containment, firefighters need a safe work environment. Safety and firefighting procedures are influenced by environmental factors that dictate the strategy and tactics during initial and extended attack. When the suppression environment is determined to be unsafe, tactics, and strategy must be altered to provide for firefighter and public safety. A common safety issue is heavy fuel loadings and continuous ladder fuels that can generate increased flame lengths, greater fireline intensities, and increased spotting potential. These conditions are currently found in the Airport Road vicinity and can decrease line production rates, aerial retardant effectiveness, and access to escape routes and safety zones. The preferred and safest method of fire control is direct attack utilizing the previously burned area as a safety zone. In dense forested stands with high ground fuel levels, during 90^{th} percentile weather (when burn indices are very high), fire behavior exhibits flame lengths in excess of eight feet which is the limit for direct attack for equipment (Fireline Handbook 2006).

Fire Suppression Effectiveness

Reduction of surface fuels, ladder fuels, and canopy closure creates conditions, which improve fire suppression effectiveness. The degree of improvement is directly proportional to the reduction of those fuels. Fire behavior in treated stands exhibits decreased rates of spread, fireline intensity, and propensity to transition into the mature canopy. Fires that move from untreated into treated areas show decreased fire behavior and decreased fire severity. Studies of fire behavior in similar situations and environments have shown that active crown fires transition into surface fires when encountering treated stands (Fites 2007; Murphy 2007).

Treated stands allow for safer and more efficient firefighting operations. Line production rates are increased and aerially delivered suppressants and retardants have increased effectiveness (Fireline Handbook 2006). Altered fire behavior (such as decreased fireline intensity) allows for direct attack methods, which contain the fire at a smaller size and increase firefighter safety.

3.5.2 Environmental Consequences

No Action - Alternative 1

No action in the project area would result in no thinning, shelterwood harvest, precommercial thinning or under-burning used to improve forest health and reduce fire hazard (this area is mostly jack pine). Currently even a small fire in the project area has the potential for placing lives and property at risk, especially during periods of higher fire danger. The close proximity of untreated federal lands to a densely populated area present a situation where a fire within the WUI can quickly exceed the production capabilities of both structural and wildland fire organizations. Within such an intermixed area, a fire start on either federal or private can have similar results since both type of ownership could ultimately be involved in a fire. The area would continue to experience tree mortality at or near the current rate. Stands would continue to be self-thinning and fire would not play its role in the recycling of excess fuels. The fuel loading would continue to increase with the accumulation of ground and surface fuels on the forest floor and the increased availability of ladder fuels in the form of seedlings and saplings. The possibility of fire carrying into the canopy would also remain high without the removal of any trees to reduce the fuel arrangement and continuity or increase the canopy separation. Fire fighter safety would not be improved and fireline construction rates would not increase. Fire intensity levels would not be reduced.

Future fires would burn with more intensity, resulting in dramatic changes to one or more of the following: fire size, severity, and landscape patterns. Fire would be more difficult to suppress and firefighter safety would be compromised. Firefighters would have trouble in moving and constructing fire line through the heavily loaded surface fuel component. Present day fuel conditions would produce an average of 4.5 to 16 foot flame lengths at the 90^{th} percentile, making fires too intense for direct attack by personnel constructing handline or equipment in certain stands. Fires would burn with greater severity, which increases the risk of losing key ecosystem components such as native species, large trees, riparian habitat, and wildlife habitat. The severity of fire effects on soil would increase, as would the erosion and its effects on the local watersheds. Public and private landowners near the project area would face increasing threat from a wildfire event.

Alternatives 2, 3, and 4

Direct and indirect effects

The fuels treatment activities and acres treated in Alternative 2, 3, and 4 are similar. There is more acreage of prescribed fire with Alternative 3 due to an emphasis on barrens restoration along Twin Pine Road. Alternative 4 has less prescribed fire and thinning due to the elimination of several stands to the northeast of the community at risk. The acres to be treated by Alternatives 2, 3, and 4 are displayed in Table 3.5.2. Hazardous fuels reduction treatments are proposed in 18 stands near the community at risk. The fuels reduction treatments consist of :1) prescribed burn to remove hazardous fuel accumulations and restore ecological processes 2) convert red pine to less fire-prone species in select locations 3) remove ladder fuels throughout strategically located stands in entirety and 4) treat residual slash from conifer timber sales by biomass utilization or pile burning.

Table 3.5.2: Treated acres by alternative to reduce hazardous fuels

Treatment	Alternative 2	Alternative 3	Alternative 4
Prescribed fire	2527	2733	2039
Replace jack pine with more fire resistant species	44	44	44
Pre commercial thin	48	48	48
Thinning hazardous fuels	4044	3933	3765

The intent of ladder fuel reduction is to remove intermediate height fuels that would allow a surface fire to "ladder" into the canopy and become a crown fire. By reducing canopy bulk density through thinning, wider canopy gaps are created. This can prevent a running crown fire from occurring, although isolated group torching may still occur. Species conversion from jack or red pine (fire receptive species) to more fire-resistant species such as white pine would reduce fire behavior to a level where ground firefighting forces would be able to engage in fire suppression activities. For effective fuels treatment, cut vegetation must be further reduced by burning piles, compressing it or removing it from the site as biomass.

Under burning for Alternative 2, 3, and 4
The controlled use of low intensity fire to burn within a thinned mature forest would reduce surface fuel loading, further reduce ladder fuels, and raise crown base heights. Raising the canopy base height and reducing surface fuel loading would help keep a surface fire from reaching the tree crowns, reducing the likelihood of a crown fire. Under burning would disrupt the continuity of surface and intermediate fuels, reducing the intensity of potential future fires.

Under burning would reduce fire intolerant species reproduction and reintroduce fire to its natural role in the ecosystem. Low intensity prescribed fire would maintain an open stand with a mature over story that is less susceptible to high severity fire and would provide a safe and effective fire suppression environment. Reintroducing fire would aid in natural nutrient cycling enhancing the health and vigor of the treatment areas.

3.5.3 Cumulative Effects

The timeframe for cumulative effects considered fire ecology dating to pre-settlement times and a detailed fire history from 1987 to 2009. The geographical extent was the project area; since the goal was to protect the WUI there was no need to go outside the immediate WUI area.

The proposed action would allow for increased effectiveness and safety of suppression resources and reintroduce fire in its natural role in the ecosystem. It would also compliment restoration efforts that are taking place on surrounding lands owned by state and private landholders.

Summary
Firefighter and public safety would continue to be the first and foremost goal of the Forest Service. The proposed treatments would reduce fuel loadings on all treated sites such that fireline intensities would stay below the threshold that, allows for safe direct attack at the head of a wildfire by ground resources. The proposed actions are considered effective toward this end.

The proposed treatments meet forest wide standards and guidelines. Fire intensity during 90th percentile weather conditions would be low. Flame lengths would be less than 4 feet and fire could generally be attacked at the head with firefighters using hand tools. A surface fire would not be expected to transition to a crown fire.

3.6 Management Indicator Species and Management Indicator Habitats

The forest plan identifies seven Management Indicator Species (MIS) that are required to be monitored on a yearly basis and evaluated every five years (p. 4-6, Table 4-1). In addition to these seven species, appendix II of the forest plan (p. II-1) identifies four MIH that would be monitored.

The purpose of this section (from the MIS-MIH Report) is to identify the habitats and species that could be affected by the Lakewood Southeast Project, and to identify any environmental issues associated with those effects. For the purposes of wildlife effects analyses, short-term effects are five years or less and long-term effects are greater than that (often up to 50 years) (St. Pierre 2010). Where applicable, in growth and outgrowth of habitat (changes resulting from natural aging of stands) was also projected. These projections represent a major component in the cumulative effects analysis for any Forest project and cumulative effects analysis boundary. Data used in the cumulative effects analysis for individual species can be found in the project record.

3.6.1 Affected Environment

Mature northern hardwood interior forest (MNHIF)

There are currently 33,346 acres of MNHIF on the district and 145 acres are in the project area. Within the project area, there are 60 acres with proposed treatments.

Mature red/white pine forest (MRWPF)

The forest plan FEIS defines "mature" in terms of red and white pine as greater than or equal to 70 years of age (p. 3-155, 178). "Natural origin" means these pine stands were not of plantation origin, either fire origin or from natural seeding, (forest plan FEIS, p. 3-155). There are currently 14,043 acres of MRWPF on the district and 3,244 acres are in the project area. Currently the project area has 3,244 acres with proposed cuts ranging from 1,816 acres to 2,257 acres in the action alternatives.

Pine Barrens

There currently is no Pine Barrens habitat in the project area or on the district. This project proposes to restore between 1,000, 800 or 300 acres of this habitat depending on alternative. Restoration of the Pine Barrens would be done through a combination of timber harvests and prescribed fire. The harvest treatments would change the current high-density forests in the area to low-density, open conditions dominated by grasses, shrubs, red pine, and jack pine.

Regenerating aspen forest

There are 6,986 acres of aspen in the project area; however, only 765 acres are (11 percent) under 20 years of age. Regenerating aspen is an early successional habitat that is utilized by a

number of songbirds, game birds, and game animals including golden-winged warblers, chestnut-sided warbler, indigo bunting, American woodcock, ruffed grouse, and white-tailed deer.

Gray wolf, Bald Eagle, Red-shouldered Hawk, and American Marten
These species are also RFSS and are analyzed in the BE. The bald eagle is rare or uncommon in the project area. The gray wolf and bald eagle for all alternatives and the red-shouldered hawk for the No Action Alternative are a "no impact" determination. A determination for red-shouldered hawk in the action alternatives is "may effect individuals".

Northern goshawk
There are three goshawk-nesting territories in the project area: two on the district and one on private land. Currently, the goshawk is an uncommon resident in the north and an uncommon migrant in the central and southern parts of the state. However, exceptional numbers of goshawks may occur approximately every 8-10 years when ruffed grouse and snowshoe hare populations are low in the bird's northern range (Robbins 1991). Since 1968, monitoring efforts by the WDNR and FS have documented more nests.

Brook trout
There are 1,072 miles of Class I and II trout streams on the CNNF, representing 13.8 percent of the Wisconsin trout streams. There are nine classified I or II trout streams within the project area.

Canada yew
There are 278 known Canada yew sites on the CNNF and 244 of those are on the NNF and 71 within the district. There are currently two records of Canada yew in the project area and they are located in MA 8G and 8F. Their populations are monitored on a yearly basis and then evaluated every five years. Total number of document yew sites (new and existing) on the CNNF has increased every year from 2001 to 2011.

3.6.2 Environmental Consequences
This section would address Issue B by analyzing the projects effects on MIS/MIH.

Alternative 1
Mature Northern Hardwood Interior Forest, Mature Red/White Pine Forest and Canada Yew
This alternative does not propose to treat any of this habitat type; therefore, would not result in any immediate direct or indirect effects.

Regenerating Aspen Forest
Alternative 1 would not regenerate any acres of aspen in the short-term; however, without some type of disturbance (fire, wind, harvesting, etc.) these aspen stands would naturally convert to other forest types as the aspen dies, thereby reducing the potential pool of acres for regenerating aspen.

Northern Goshawk
The project area, the district, and the Nicolet National Forest (NNF) were used for evaluating direct and indirect effects to the species. Any goshawks nesting or foraging within the project area have the potential to be directly (destruction of nest tree) or indirectly (loss of habitat) affected by the proposed activities.

There would be no direct or indirect effects to the species or its habitat because no actions would occur. The result of not implementing any timber harvesting activities within upland habitat would be a passive maintenance or enhancement of nesting habitat for the species. This would occur through the maintenance or increase of canopy closure in these mature northern hardwoods stands. Early successional habitats would not be regenerated by active aspen vegetation management; therefore, they would decline in the project area. This habitat is utilized by goshawk prey such as ruffed grouse and snowshoe hare. Erdman (2006) indicated those goshawks are prey density dependent species, and prey populations affect adult and young survival, number of eggs laid, and territory size. In general, suitable nesting habitat is not productive foraging habitat. Salafsky et al (2008) noted that goshawks need a wide variety of prey availability to sustain reproductive levels and indicates that forest management that sustains prey abundance is important to management of this species. The result of not implementing any aspen timber harvesting activities would result in fewer habitats over time for prey species such as ruffed grouse and snowshoe hare. Due to this reduction, goshawks would likely focus on other prey items such as red squirrels, robins, blue jays, and small mammals that are anticipated to be available. Also in this alternative, the amount of coarse or fine woody debris deposited on the forest floor would not change from the current accrual rate. This biomass would continue to provide forage and cover habitat for several goshawk prey species.

Brook Trout
Alternative 1 does not have any harvest treatments. Some indirect impacts to brook trout could occur, as there would be no conversion away from aspen towards long-lived species. No roads would be decommissioned within 660 feet of the Class I, II, or III trout streams.

Action Alternatives
Mature Northern Hardwood Interior Forest(MNHIF)
Alternatives 2 and 3 propose selective cuts within MNHIF stands (totally six acres), specialty cuts (two acres), and shelterwood cuts (52 acres). The selection treatments would maintain closed canopy and thus not change the age or forest type of these stands resulting in them still being classified as MNHIF. The shelterwood and specialty harvests would reduce crown closure below 80 percent after the first prep cuts producing a variety of canopy closure percentages throughout the stands. Both of these treatments would result in the stands not being classified as MNHIF for 50 years. Alternative 4 has no proposed treatments in MNHIF and would have no effects.

Mature Red/White Pine Forest (MRWP)
Currently the project area has 3,244 acres with proposed cuts ranging from 1,397 acres to 1,744 acres in the action alternatives, including thinning. Thinnings would occur within 1,209 acres in Alt. 2, 1,195 acres in Alt. 3, and 1,156 acres in Alt. 4. This harvest treatment would not change the age or forest type. It would improve the quality and accelerate the growth of the remaining trees.

Proposed harvest that would remove pine stands from this category would be clearcuts, shelterwood, and specialty cuts (similar to shelter wood). These cuts are required in the project area because there is a need to modify the project area's white and red pine age class distribution to more closely reflect the forest plan desired future conditions. They would also restore Northern Dry Forest back into a forested community in which it has not been for over 100 years. Of these harvest treatments, the total acres harvested for Alternatives 2, 3 and 4 would be 535, 370, and 241 acres respectively. These totals would all be less than four percent of the district and two percent of the NNF landbase.

Pine barren communities are considered imperiled both globally (G2) and in the state of Wisconsin (S2) by the WDNR Natural Heritage Inventory program. Because many rare species of flora and fauna depend on barrens habitat, there is great concern that Pine Barrens habitats in Wisconsin be maintained or restored. This community would also have a beneficial impact on from this project in the long-term, as all action alternatives would include red and white pine planting.

The age class distribution of both these pine types would be modified mainly by regenerating older stands into new, young stands. For red pine stands, clearcut harvests would be used and for white pine stands, shelterwood harvests would be used. These cuts would represent only 0.9 to two percent of the total acres of MRWP on the Nicole Land base (Table 3.6.1).

Table 3.6.1: Acres of proposed harvest treatments by alternative within MRWP stands

Alternative	Clear Cut	Shelterwood	Specialty Cut	Total	% district	% NNF
2	120	485	30	635	4.5%	2.0%
3	207	245	30	482	3.4%	1.5%
4	90	177	30	297	2.1%	0.9%

Regenerating Aspen Forest

Under Alternatives 2, 3, and 4, the acres of regenerating aspen (Issue A) would increase by 736, 1,272, and 35 acres respectively. In general, aspen types are decreasing on the CNNF and all action alternatives shift the age class distributions towards the youngest age classes that are the most deficient. This shift would provide future management opportunities to move towards the desired age class distribution; therefore is consistent with forest plan goals and objectives. However, this shift in age class distribution within the project area contributes minimally towards the overall forest level distributions because the project's aspen acres are such a small percentage of the total aspen acres on the NNF and CNNF.

Alternative 3 would be the most beneficial for ruffed grouse, American woodcock, and Golden-winged warbler by providing the most early successional habitat. Alternative 2 and to a much greater degree Alternative 4, would further the trend of early successional habitat loss and reduce its availability for these species as well as other species that use this habitat. The larger amounts of aspen regeneration are important due to over the next five years, 537 acres (70 percent) of the currently existing early-successional habitat would age beyond 20 years old and thus would not be considered early-successional habitat.

Northern Goshawk

Boundary and Scale of Effects Analyses

Multiple spatial scales were used to evaluate meaningful effects to goshawk. For evaluating direct and indirect effects to the species, the project area was used. Any goshawks nesting or foraging within the project area have the potential to be directly (destruction of nest tree) or indirectly (loss of habitat) affected by the proposed activities.

Cumulative effects to goshawks are analyzed at the scale of the district and the Nicolet landbase. This analysis area is appropriate for several reasons:

1. In over two decades of study of goshawks in Northern Wisconsin by Tom Erdman and others, no birds have been recorded to move between the Forest's Chequamegon and Nicolet landbases and dispersal between these two areas is extremely unlikely based on recorded movements of banded individuals. In only one instance was a bird banded on the Nicolet landbases found a great distance away (more than 50 miles), in this case, Ontario. This individual, a juvenile male, dispersed, as juvenile males of many raptor species are known to do, but returned to its natal territory to breed, thus having no effect on the distant population. The degree to which populations on the Chequamegon and Nicolet landbases interact is unknown but no bird band or other information exists that compels an analysis area that is so large as to include both the landbases of the CNNF.
2. The cumulative effects area is relatively contiguous and because it is predominantly a forested landscape, it is reasonable to assume that individuals could move freely within this boundary.
3. Although goshawk nesting in the northern portion of the Nicolet landbase may forage in the Ottawa NF, no known occupied goshawk territories are known from the Wisconsin-Michigan border north greater than 20 miles. In addition, the southern portion of the Ottawa NF that adjoins the NNF includes a substantial proportion of private land (especially along Hwy 2) that partially breaks up the suitable habitat. Furthermore, the Ottawa NF has not been actively managing the vegetation of that portion of the Forest for over 15 years and, for that reason, there are no effects of forest fragmentation on goshawk to include in a cumulative effects analysis for the project.

However, acres of available suitable habitat on the CNF would be presented for discussion purposes only. The temporal scale of the cumulative effects analysis includes past actions (with emphasis on those that have occurred over the past five years) and those that are reasonably foreseeable. Beyond five years, the effects to goshawk are undetectable in northern hardwoods forest because within five years canopy gaps created during thinning or improvement cuts have closed such that canopy closure at the stand meets or exceeds 80 percent. Activities such as even-aged harvest have long-lasting effects because they take habitat that may be (or may have been) suitable to goshawk and make it unsuitable for approximately 50 years. Essentially, the effects of even-aged treatments in the past are manifest in the records and projections of suitable goshawk habitat. These actions would be considered for each of the geographic areas described above.

Threshold of Effects

The Biological Evaluation for the forest plan identifies key factors that were determined to be important to the assessment of viability of northern goshawk (p. J-67 to J-70). These key factors

were developed during the forest plan revision process (p. B-25 to B-33) by the Population Viability Assessment and Species Viability Evaluation (SVE) panel. Key factors include mature, closed-canopy northern hardwoods forest and habitat fragmentation. Figure J-6 (p. J-69) comparing the acres of interior forest among forest plan alternatives is referenced in the "Effects to Habitat" section which reinforces the importance of MA 2B, 3B, and 4B to the viability evaluation of effects to northern goshawk. Further, management consistent with the forest plan in MAs 2, 3, and 4 are all considered important to the viability of goshawks (p. J-68) therefore compliance with the forest plan, particularly as it relates to mature northern hardwood forest, is an appropriate context for discussing the effects on viability of forest raptor species. This emphasis is further apparent in the cumulative effects discussion for goshawks (p. J-70) where allocation to interior forest management is implicated as driving the ecological judgments for Alternatives 3-9 [and the Selected Alternative]. While suitable habitat may be available in management areas that emphasize forest types other than northern hardwoods, such as MA 1 and MA 8, management consistent with MA-specific direction was expected in the viability evaluation of the forest plan presented in the BE (appendix J). Suitable habitat totals resulting from the model (see red-shouldered hawk- for the information on the model) described above represent all habitats meeting the criteria of "goshawk nesting habitat" regardless of the management area in which the habitat is found.

Determination of Effects to Northern Goshawk

Active forest management in the area surrounding the nest protection zones (including the post-fledging area) may increase prey availability and therefore goshawk productivity. Further supporting the viewpoint that goshawk are "prey-limited" is a recent study (Salafsky et al 2008); though from the Southwestern US, that concluded "conservation strategies concerned with the status of goshawk populations may incorporate forest management practices that increase the abundance, diversity, and availability of prey resources."

Furthermore, consistent with the project's Need 7B to improve raptor nesting habitat by increasing the conifer component in forested stands, this emphasis on conifer restoration through the project area is likely to increase the suitability of the post-fledging area as suggested by Donner et al. (in press) based on a decade of nesting data from the CNNF.

Under all action alternatives, the two-goshawk nests on CNNF lands would be protected following the guidelines of the forest plan (p. 2-20 to 2-21). These guidelines are consistent with the WDNR working guidelines for forestry (Woodford J 2008) and would be followed under all action alternatives to protect goshawk reproduction, which is believed to be the limiting life history stage of the species in Wisconsin.

The amount of goshawk habitat varies per alternative. Currently, there is 5,274 acres of habitat available to goshawks within the project area. Action alternatives propose to treat 3,104, 2,670, and 950 acres respectively of suitable nesting habitat with harvest treatments other than selection cuts. Selection cutting of suitable habitat would not adversely affect the habitat for goshawk because the result of the harvest is a stand that still has high (greater than 80 percent) canopy closure and trees in the large-diameter classes preferred for nesting by the species. Other harvest treatments such as clear-cuts, improvement cut, thinning, and removal cuts make the habitat unsuitable over the short and long-term.

Effects from the initial analysis that at the time of implementation and five years post implementation for Alternative 2 and 3 there would be a loss of 46-56 percent of suitable habitat (Table 3.6.2.1). This was mainly due to the many shelterwood harvests planned in mature upland hardwood stands. As with the red-shouldered hawk, this amount was a concern based on the assumption that all of the shelterwood harvests proposed include additional seed/removal cuts making that habitat unsuitable for $\geq$ 50 years.

Table 3.6.2.1: This table shows goshawk habitat in the project area, district, and NNF. For the 2011 and 2018 projections, the effects of all other projects within the analysis area are included

Project Area	**Alt. 1**		**Alt. 2**		**Alt. 3**		**Alt. 4**	
Current Condition (2011)	5,039		5,039		5,039		5,039	
Following Implementation (2013)	5,083	0.9%	2,171	-56.9%	2,605	-48.3%	4,197	-16.7%
Five years after Implementation (2018)	4,972	-1.3%	2,705	-46.3%	2,700	-46.4%	4,495	-10.8%
Lakewood-Laona Ranger District	**Alt. 1**		**Alt. 2**		**Alt. 3**		**Alt. 4**	
Current Condition (2011)	127,193		127,193		127,193		127,193	
Following Implementation (2013)	127,322	0.1%	124,410	-2.2%	124,844	-1.9%	126,436	-0.6%
Five years after Implementation (2018)	129,610	1.9%	127,343	0.1%	127,338	0.1%	129,133	1.5%
Nicolet National Forest	**Alt. 1**		**Alt. 2**		**Alt. 3**		**Alt. 4**	
Current Condition (2011)	250,107		250,107		250,107		250,107	
Following Implementation (2013)	250,352	0.1%	247,440	-1.1%	247,874	-0.9%	249,466	-0.3%
Five years after Implementation (2018)	253,936	1.5%	251,669	0.6%	251,664	0.6%	253,459	1.3%

In an effort to reduce the long-term effects of the proposed treatments on goshawk habitat, approximately 606 acres upland hardwood would be limited to shelterwood prep cuts that would be similar to a commercial thin cut. While these treatments would probably result in fewer acres of young oak stands over the next fifteen years, they would still move the stands toward long-term desired conditions while ensuring nesting habitat is maintained.

These stands are near or adjacent to each other, which would then continue to provide the large block hardwood habitat that this species typically utilizes. As a result, this would eliminate the long-term unsuitable habitat conditions from the original proposal to those stands only being unsuitable habitat for possibly five years (Table 3.6.2.2) and thus reducing the impacted acres by almost 14 percent. The acres of effected habitat could be less due to the harvested stands could still be utilized by goshawks immediately after harvest. The stands would have a canopy closure between 70 – 80 percent, which is a level that goshawks have used in forested stands for nesting (Currnutt 2009). The mature upland hardwood trees would remain throughout the stand with improved growth and thus possibly used as nest trees. These stands would have winter harvest

only restrictions to insure no disturbance to the birds during breeding season from harvest operations.

Table 3.6.2.2: This table shows goshawk habitat at the scale of the project area, district, and Nicolet landbase after change with shelterwood harvest treatments to prep cuts only

Project Area	**Alt. 1**		**Alt. 2**		**Alt. 3**		**Alt. 4**	
Current Condition (2011)	5,274		5,274		5,274		5,274	
Following Implementation (2013)	5,318	0.8%	2,406	-54.4%	2,840	-46.1%	4,432	-15.9%
Five years after Implementation (2018)	5,207	-1.3%	3,546	-32.8%	3,541	-32.8%	4,838	-8.3%
Lakewood-Laona Ranger District	**Alt. 1**		**Alt. 2**		**Alt. 3**		**Alt. 4**	
Current Condition (2011)	127,193		127,193		127,193		127,193	
Following Implementation (2013)	127,322	0.1%	124,410	-2.2%	124,844	-1.85%	126,436	-0.6%
Five years after Implementation (2018)	129,610	1.9%	127,949	0.6%	127,944	0.59%	129,241	1.6%
Nicolet National Forest	**Alt. 1**		**Alt. 2**		**Alt. 3**		**Alt. 4**	
Current Condition (2011)	250,107		250,107		250,107		250,107	
Following Implementation (2013)	250,352	0.1%	247,440	-1.1%	247,874	-0.9%	249,466	-0.3%
Five years after Implementation (2018)	253,936	1.5%	252,275	0.9%	252,270	0.9%	253,567	1.4%

Despite the modified prescriptions described above, long-term reduction in suitable habitat for goshawks would occur in the project area, consistent with forest plan (MA) direction for this area. By 2018, there would be a recovery and in growth of 1,251 acres of suitable habitat with Alternative 2, 812 acres in Alternative 3, and 517 acres with Alternative 4. At that time, there would be a reduction of suitable habitat by 32 percent for Alternatives 2 and 3, and only eight percent for Alternative 4. These reductions would result in limited opportunities for the project level goshawk population to expand and establish new nesting territories in the area. However, this may not have that much of an impact as expected due to the large amount of suitable habitat that has been available for more than 10 years but has not had any active goshawk nests. This may be a result of the project area being located on the southern end of the goshawks breeding range and thus the birds occur at a much lower density. Also, even though suitable habitat has been identified, most of the management areas in the project are 4A Conifer: Red-White Pine and 4B Conifer: Natural Pine-Oak, which have a majority of their landscape composition and structure that are not ideal for goshawk nesting habitat.

However, these are the consequences of restoring a Northern Dry Forest community and an extirpated barrens habitat. Both of these habitats historically existed prior to fire suppression activities and are not considered suitable woodland hawk habitat. The Northern Dry Forest community is considered rare (S3) in the state and has a global ranking of very rare (G3). The WDNR has identified this part of the district and project area as having a major opportunity to accomplish this goal (WDNR, 2011).

Pine Barren communities are considered imperiled both globally (G2) and in the state of Wisconsin (S2) by the WDNR Natural Heritage Inventory program. Because many rare species of flora and fauna depend on barrens habitat, there is great concern that Pine Barrens habitats in Wisconsin be maintained or restored. The forest plan also gives direction to restore and/or emulate natural disturbance regimes that were historically present within these currently existing pine communities (Objective 1.4b, c p. 1-3). This would be done through a combination of timber harvests and prescribed fire. The harvest treatments would change the current high-density forests in the area to variable-density conditions. Under planting and timber stand improvement activities would aid in the establishment of white pine and other desirable species (see under planting chart project file). The resulting habitat in the project area is not considered ideal for red-shouldered hawks. The SVE panel focused on ideal habitat only on the Forest wide conservation measures for the species through the forest plans standards and guidelines and mainly through the allocation of MA 2B. This project does not contain any MA 2B areas.

In addition to forest management that would affect goshawk-nesting habitat, the action alternatives include management that would affect the amount of young age aspen. Areas of dense young aged aspen are important for goshawk prey species such as ruffed grouse and snowshoe hare. Currently, only two percent of the aspen in the project area is within the age class of 0-10 years old and nine percent between age class 11-20 years old. This two percent of aspen is a very small percentage of suitable prey habitat could be a factor in low numbers of goshawk nests in the project area. T. Erdman et al. (1998) indicated that goshawk numbers could respond positively to increase in prey levels such as ruffed grouse and snowshoe hare. Implementation of the action alternatives would add 736 acres of young aspen in Alternative 2, 1,272 acres in Alternative 3, and 35 in Alternative 4.

Prescribed burns proposed in Alternatives 2 and 3 would occur in 213 acres (86 acres aspen and 127 acres hardwoods) of suitable habitat along with five stands used as fire breaks totaling 143 acres. In Alternative 4, there would be 75 acres of prescribed burns (32 acres aspen and 43 acres hardwoods) and 57 acres used as fire breaks. There would be no direct effects to the birds or nesting habitat from these burns due to there are no goshawk nests in any of these fire management stands and the mature potential nesting trees would not be damaged. The prescribed fires would remove down woody material that could provide habitat for small mammal prey species. However, fire would also open up the understory of these stands and create young plant growth that would increase foraging habitat for ruffed grouse that is one of the goshawks primary prey item. There is no biomass management in any stands identified as suitable goshawk habitat.

All tree regeneration and release projects occur in stands that have harvest treatments. The tree release activities would occur in immature stands and therefore would not affect nesting habitat. The tree under planting work would provide for potential nesting habitat to develop in the long-term. Cover habitat for prey species would remain intact for short-term period in the release stands. However, they would gradually be reduced in the future as the stand matures.

Road management within goshawk habitat would have the same results with all action alternatives in the following areas: 16.8 miles of decommissioned roads, 3.4 miles of open roads that would be closed, 18.4 miles of open roads that would stay open, and 3.6 miles of continued motorized trail use. The only difference is with construction of roads that would then be closed

after use; Alternative 2 and 4 is 1.5 miles and Alternative 3 is 0.8 miles. Road management activities would have no effect in all alternatives because they would not occur within the critical "no cut 30 acre" buffer surrounding the nest. There would also be a reduction in the amount of road miles in the goshawk's habitat across the project area which would then decrease vehicle traffic in that area reducing vehicle and human disturbance to the birds.

On the district, the amount of suitable habitat available to goshawk is expected to decrease slightly in all action alternatives after implementation of the project. This is also influenced by harvest treatments occurring within the Honey Creek–Padus and Boulder project areas. However, by 2018 there would be increases in suitable habitat across the district with all action alternatives. At the NNF level, there are slight decreases in available habitat immediately after treatments in 2013 across all action alternatives (less than one percent). For five years after treatment, all action alternatives show increases at the NNF level and return the total suitable habitat acre totals to 2011 amounts. These increases are due to more habitat is being created through natural processes (stand maturation) than is being lost because of timber harvest. Also, these increases are above the rate projected (+0.26% to +0.51% in 10 years) during the forest plan process for the entire CNNF. There is also a steady increase of suitable habitat on the NNF from 2013 to 2021. These eight years of increased acres results in an overall increase of 8,580 acres of suitable habitat on the NNF.

At the CNNF trend data level, there is a temporary downward trend for years 2011–2015 and this is largely due to the anticipated loss of aspen in the first decade from conversion to other species and harvest needed to maintain the species long-term. This loss was disclosed in the forest plan FEIS (p. 3-283, Table 3-70) and as such was considered by the SVE panel when assigning a Biological Outcome judgment for the northern goshawk. However, this downward trend does change with an increase of suitable habitat between 2019 and 2021.

Chart 3.6.2.3: This shows northern goshawk habitat trends for Chequamegon (CNF) and Nicolet (NNF) landbases; all suitable forest types included.

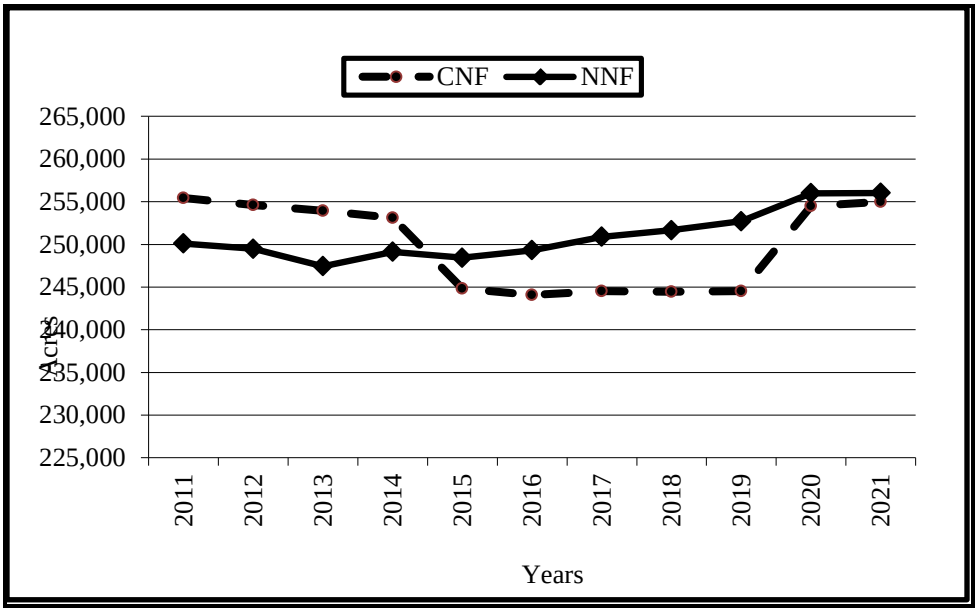
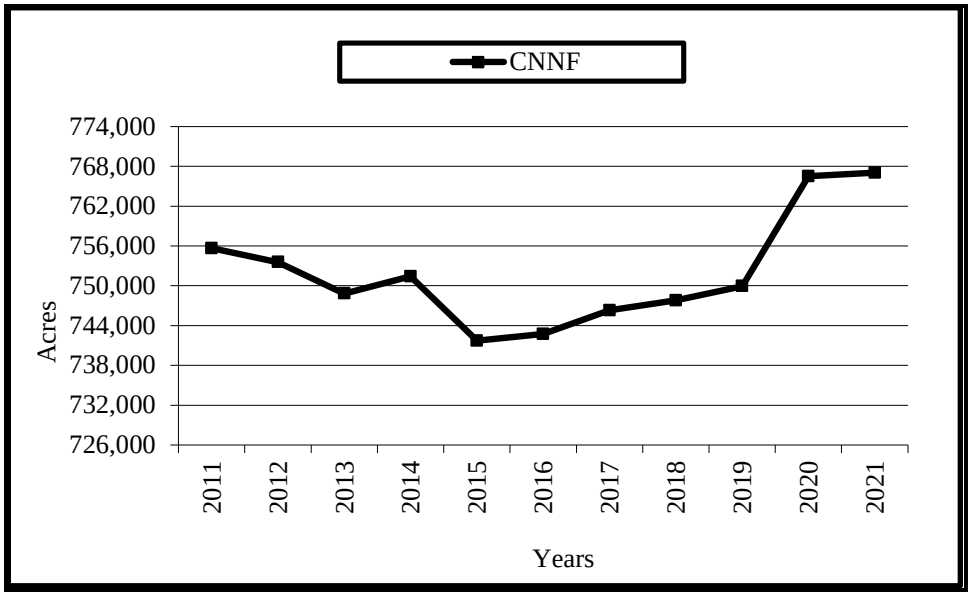


Chart 3.6.2.4: This shows northern goshawk habitat trends forestwide (CNNF); all suitable forest types included.



In conclusion, implementation of the project may impact individuals but not likely to cause a trend to federal listing or loss of viability. The two active nests within the project area would be protected from disturbance through the design features described in the forest plan. These buffers would protect and preserve the habitat in the area to be used possibly by nesting goshawks in the future (Erdman 2003). The "may impact…" determination results from the loss of suitable habitat within the project area that may reduce the potential for new birds or current non-breeding birds in the project area to establish new nesting territories. However, across the district, NNF, and CNNF there is an increase in suitable habitat to the species that would be available for the reasonably foreseeable future and thus no impact to the population at those levels under any of the action alternatives.

3.6.3 Cumulative Effects

Goshawk

Cumulative effects to goshawk are analyzed at the scale of the district and the NNF landbase.

The temporal scale of the cumulative effects analysis includes past actions (with emphasis on those that have occurred over the past five years) and those that are reasonably foreseeable. Beyond five years, the effects to goshawk are undetectable in northern hardwoods forest because within five years canopy gaps created during thinning or improvement cuts have closed such that canopy closure at the stand meets or exceeds 80 percent. Activities such as even-aged harvest have long-lasting effects because they take habitat that may be (or may have been) suitable to goshawk and make it unsuitable for approximately 50 years. Essentially, the effects of even-aged treatments in the past are evident in the records and projections of suitable goshawk habitat. These actions would be considered for each of the geographic areas described above.

On the district, the amount of suitable habitat available to goshawk is expected to decrease slightly in all action alternatives after implementation of the project. This is also influenced by harvest treatments occurring within the Honey Creek–Padus and Boulder resource management areas. However, by 2018 there would be increases in suitable habitat across the district with all action alternatives. At the NNF level, there are slight decreases in available habitat immediately after treatments in 2013 across all action alternatives (less than one percent). For five years after treatment, all action alternatives show increases at the NNF level and return the total suitable habitat acre totals to 2011 amounts. These increases are due to more habitat is being created through natural processes (stand maturation) than is being lost as a result of timber harvest. Also, these increases are above the rate projected (+0.26 to +0.51percent in 10 years) during the forest plan process for the entire CNNF. There is also a steady increase of suitable habitat on the NNF from 2013 to 2021. These eight years of increased acres results in an overall increase of 8,580 acres of suitable habitat on the NNF.

At the CNNF trend data level, there is a temporary downward trend for years 2011–2015 and this is largely due to the anticipated loss of aspen in the first decade from conversion to other species and harvest needed to maintain the species long-term. This loss was disclosed in the forest plan final environmental impact statement (p. 3-283, Table 3-70) and as such was considered by the SVE panel when assigning a biological outcome judgment for the northern goshawk. However, this downward trend does change with an increase of suitable habitat between 2019 and 2021.

On non-FS lands within and adjacent to the Lakewood Southeast Project Area, there are approximately 5,170 acres that may be suitable goshawk habitat. Assuming that the age structure of the northern hardwoods forested acres are similar to the hardwoods on FS land, most of those acres are suitable now. In the past 10 years there has been 164 acres of timber harvest in suitable habitat on state and private lands enrolled in the MFL program; 156 acres was clearcut and eight acres had an overstory removal completed thus made them unsuitable for 50 years. Over the next 10 years, timber harvests throughout the same land base there would be 335 acres of timber harvest. Most is scheduled to be clearcuts (255 acres) that would make those stands unsuitable long-term and 80 acres would be thinned making them unsuitable for five years. For other suitable habitat on lands with no harvest information, we would assume a 15-year re-entry cycle for the northern hardwoods that they are evenly distributed among the years since their last harvest. Approximately 200 acres of that habitat would be selectively harvested in any given year and the treatments would make that habitat unsuitable for a period of five years at most, if at all. The result is approximately 93 percent of the other ownership land hardwoods (2,820 acres) are assumed available to nesting goshawks in any given year. These acres of habitat add to the suitable unoccupied habitat on the CNNF and result in an abundance of habitat for goshawks in and around the project area.

Brook Trout

Many older aspen stands contain a strong oak or hardwood component and by thinning these stands, the district would reduce the aspen component and convert these stands to oak or hardwood types. It would also help long-term to provide large trees for recruitment of large woody material into these areas, which would likely enhance the habitat for many species, including in stream cover for trout. Alternative 4 would have the least amount of aspen regeneration or aspen conversion; no aspen harvest would occur if all or most of the timber stand falls within the selected stream buffers.

Canada Yew
None of the action alternatives has proposed harvest treatments in any stands that contain Canada yew and thus there is no direct effect.

3.6.4 Deer impacts on MIS/MIH

The project area resides in Deer Management Unit (DMU) #49A that recorded a post-hunt population of 19 deer per square mile in 2010 (Rolley 2012). In 2009, the white-tailed deer population goal for DMU #49A was lowered from 25 to 20 deer per square mile, due to concerns for forest regeneration and composition (WDNR 2009). The deer density for this unit at the end of the 2010 hunting season was five percent under that population goal (Rolley, 2012). The projects population goal and current densities are below the 20 deer per square mile, which would promote diverse and abundant tree, shrub, and herbaceous vegetation (McGuinness, B. and D. deCalesta 1996). This "no effect" from deer would also continue into the future because the deer populations are not expected to increase (Quinn, B., D. Eklund, M. St Pierre and J. Schmidt 2006). Thus, deer populations are expect to be similar to those of the past and under those densities, Canada yew has successfully maintained healthy populations within the project area. All of these treatments would occur in upland communities that are not strongly dominated by hemlock. In those situations, Canada yew populations have experienced some declines, but it cannot be fully explained by deer browse (Foster 1993). All of these treatments would occur in upland communities that are not strongly dominated by hemlock.

Deer over-browsing has been a concern, largely as a result of the high deer numbers in some areas of Wisconsin and the evidence of impacts those large herds can have on damaging ecosystems. While deer over-browsing can be a concern, timber harvesting on the CNNF is not at the heart of this problem. The states deer herd population has fluctuated over the years with an overall increasing trend while other factors are taking place. These other factors can have an impact on the deer populations and are beyond the control of the proposed project. The Winter Severity Index has been mild to moderate during 14 of the past 15 years (93 percent) (Jacques, 2012). Mild winters allow deer to emerge from winter in good condition with minimal herd loss to winter mortality (WDNR 2000). Baiting and feeding deer continues as a state approved activity-providing deer with high-energy foods that can affect their ecology. Baiting is believed to impact daily and geographic behavior, increase survival and reproductive rates, impair harvest opportunities, and affect natural processes including timely yarding and winter mortality of deer (McCaffery 2000) (WDNR 2000). Deer harvest quotas are not set by the CNNF as the WDNR regulates them in the state and on the CNNF. DMU #49A is a typical northern forest unit comprised of public accessible National and County Forest lands. It contains an estimated 235 square miles of deer range with 15 deer /square miles that has decreased from 32 deer /square miles in 2004. CNNF acreage in this unit is maturing, providing less usable habitat for deer and herd productivity is slowly declining as a result. The unit is currently below goal but a limited antlerless harvest is possible while still maintaining herd stability. In 2011, the buck kill increased slightly compared to 2010 while limited antlerless harvest opportunities were provided after a zero antlerless quota in the 2010 season. This unit was in a regular buck plus quota season structure with limited antlerless harvest in 2012 (WDNR 2012). In addition, the overall timber harvesting including aspen clearcutting has gone down on the CNNF. A Forest Service unpublished report by Quinn et al, (2006) identifies deer trends on the CNNF and factors

affecting or not affecting those deer trends. In terms of browsing, high deer numbers may cause over browsing damage to forest diversity (Alverson et al 1989), (Rooney et al 2004), (Cote et al 2004). However, recent research suggests that understory richness may have no correlation to deer densities and use (Rutherford, A.C. and O.J. Schmitz, 2010) or in some cases may enhance plant diversity (Royo et al 2010). Further, recent research also indicates that in some circumstances increasing the amount of early successional forest habitat may actually have substantial impacts on reducing deer herbivory in areas where other desired forest species may be limited by herbivory (Miller et al 2009).

This project is not converting other forest types (i.e. northern hardwoods or native pine stands) to aspen hence adding potential deer habitat to the landscape. Actually, the proposed harvest treatments in all alternatives reduce aspen composition in the long-term within the project area by converting the stands to other upland species. However, it does regenerate currently existing aspen/mixed aspen/paper birch stands that already provide deer habitat at varying levels. It is true that the regenerated stands under all action alternatives would improve the amount of available browse that would exist within these areas over a 5 - 10 year period over what may currently exist due to stand growth conditions. Deer browsing of aspen has not been shown to be a problem on regeneration capability of aspen, paper birch or mixed aspen forests on the CNNF. In addition, it is also plausible that providing this browse could work to limit herbivory effects in other forest types near these project areas as was found in Miller et al. (2009) by providing readily available browse in relative abundance to other less available palatable browse species in nearby stands.

In regards to increasing deer abundance via timber harvesting to create early successional habitat, as proposed in this project, deer abundance is highly influenced by a host of variables discussed early in this section. Hunter harvest success, recruitment rates, winter severity, placement of abundant amounts of bait and feed, disease, and predation, all play significant roles in deer abundance. Quinn et al (2006) looked at the question of aspen regeneration and influences on deer abundance. He concluded that deer were likely responding to either climatic, human related or some combination of these factors rather than responding solely to the harvest of timber on the CNNF.

With multiple years of heavy antlerless harvest (2003-2009) by hunters, the WDNR was able to reduce deer abundance across at least 19 DMU's in northern Wisconsin. This suggests that human induced harvest along with disease outbreaks may play the single largest role in controlling deer abundance. Hence, it is unlikely that this project by itself would contribute significantly to increasing deer abundance. It is best summarized on page 3 of Quinn et al (2006) where it states, "though high deer numbers may cause over browsing damage to forest diversity, this is not a result of aspen management from logging on the Forest." Rather, the level and success of deer harvest coupled with winter severity and baiting are the main drivers of deer abundance on the landscape.

Inventorying Canada yew sites on the CNNF continue and are focusing on MA 2B areas were the data would be compare from previous inventories to evaluate trends. Analysis would identify which sites are newly discovered and which are the result of reintroduction efforts. Analysis would also qualitatively assess the effectiveness of MA 2B areas in reducing the

intensity of herbivory by white-tailed deer (Forest Service 2012). This monitoring effort is not a part of the project but may include yew occurrences within the project area.

Implementation of any of the action alternatives would result in no measurable effect for this species. No measurable effect is because of the low number of plant sites in the project area, risk of damage and loss of individual plants by deer would be minimal, and no harvest treatments are conducted in stands that have Canada yew plants. Availability of suitable habitat is not a risk factor.

3.6.5 Conclusion for all MIS/MIH species

In conclusion, implementation of the project may impact individuals but not likely to cause a trend to federal listing or loss of viability. The two active nests on FS lands within the project area would be protected from disturbance through the design features described in chapter 2, Section 2.3.1(C) and the forest plan. These buffers would protect and preserve the habitat in the area to be used, possibly, by nesting goshawks in the future (Erdman 2003). The "may impact…" determination results from the loss of suitable habitat within the project area that may reduce the potential for new birds or current non-breeding birds in the project area to establish new nesting territories. However, across the district, NNF, and CNNF there is an increase in suitable habitat to the species that would be available for the reasonably foreseeable future and thus no impact to the population at those levels under any of the action alternatives.

The conclusion based upon my findings is that the effects to the MIS and MIH (Mature northern hardwood interior forest and Mature Red/White Pine Forests) addressed in this report would be minor as a result of the management activities proposed within the project area. There would be a beneficial effect to the Pine Barrens and regenerating aspen due to the increased acres produced from the proposed management activities.

3.7 Non-native Invasive Species (NNIS)

This section analyzes how the proposed Lakewood Southeast Project would affect the spread (Issue B), introduction, establishment, and persistence of Non-Native Invasive Species (NNIS). Direct and indirect effects are measured by proximity to NNIS infestations, travel through infestations, soil disturbance, and light availability.

Threshold

The forest plan does not define a threshold for NNIS management. The forest plan standard for NNIS requires the use of permissible measures to reduce spread of NNIS, which implies a general, forest-wide reduction of NNIS spread over time. The thresholds defined for this analysis are:

Direct Spread: There would be no spread of known infestations directly due to proposed actions.
Indirect Spread: Would not exceed a low risk of new introductions due to proposed actions.

3.7.1 Affected Environment

Non-native invasive plants

There are 1,723 separately recorded invasive species infestation sites (3,598 acres) on the district. The project area has 153 infestation sites (473 acres).

Non-native earthworms
The predominant land types in the project area as described in the soils section that generally do not support non-native earthworm populations. Earthworms prefer more mesic, nutrient rich, silty, or loamy soil types. Earthworms are not likely to establish widespread populations in the project area, although localized areas of suitable soils may be present in places such as riparian areas along streams.

3.7.2 Environmental consequences
The analysis area for direct and indirect effects is the project area.

Alternative 1
Direct, indirect, and cumulative effects
Alternative 1 has no activities and therefore no direct or indirect effects that would change the existing condition. Non-native invasive plants would continue to persist at their current rates and may increase through natural means of spread (animals, wind, water) or by humans (vehicles, ATV/ORVs, road maintenance), but not as a direct or indirect result of this alternative. However, because there is no road decommissioning under this alternative, vehicle use on 26.5 miles of road would continue. Since there would be no direct or indirect effects from FS actions that could contribute to NNIS spread or introduction, there would be no cumulative effects.

Action Alternatives
Direct and indirect effects
Stands proposed for treatment that contain, or are within ¼ mile of a known invasive plant location are at risk of increase spreading NNIS (see Table 3.7.2.1). There may be more than one occurrence of a species or more than one species in a stand. The infested stands have a high risk of spread when heavy equipment moves through, disturbing the soil and removing the canopy cover with harvest treatments. Stands within ¼ mile of an infestation are at a high risk of introduction, most likely by equipment or machinery transporting seed from another stand or nearby infestation along the road.

Table 7.2.1: This table comparison the alternatives by effect

Alternative	# of proposed harvest stands	# of infested harvest stands	% of infested harvest stands	# of harvest stands within ¼ mile of infestation	% of harvest stands within ¼ mile of infestation
Alt. 2	473	131	28%	195	41%
Alt. 3	422	126	30%	180	43%
Alt. 4	262	87	33%	105	40%

Soil disturbance indirectly affects establishment of NNIS by providing suitable habitat in the form of exposed soil. Invasive plant seeds would not spread from infested stands to non-infested stands by clean machinery, but drifting seed may establish easier on prepared soil than on intact soil. Site preparation, harvesting equipment, and road activities would disturb about 3.9, 3.6, and

2.1 percent of soil areas within the project area including all ownerships for Alternatives 2, 3, and 4, respectively. On only federally owned lands, potential soil disturbance within the project area for Alternatives 2, 3, and 4 would be about 4.8 percent, 4.4 percent, and 2.6 percent respectively.

The amount of light reaching the forest floor can be controlled by the amount of canopy cover. Harvests treatments such as clearcuts, special cuts, and shelterwood harvests, remove most of the canopy, and is expected to remain open for many years. Clearcutting and shelterwood harvests remove enough canopy to allow enough light to the forest floor to enable any sun-loving invasive species present to spread throughout the stand. Selection harvests and thinnings maintain a mostly closed canopy and as a result do not have a high risk of sun-loving species spreading through the stands; however, there is still a risk of introducing and spreading shade and edge tolerant species.

Alternative 2 contains 2,569 acres (43 percent) and Alternative 4 contains 770 acres (37 percent) that already contain NNIS or are within a ¼ mile of existing populations. As a result, there is an increasing risk of spread of non-native species by allowing introduced sun loving and edge species to persist until the canopy closes.

Alternative 3 contains 2,736 acres (43 percent) that are already infested or are within a ¼ mile of a known NNIS population. That would result in more acres of full sunlight due to harvest activities. Harvested stands with nearby NNIS populations would have a higher risk of infestation following harvest.

In the short-term, logging allows more light into the understory, which can introduce and establish sun-loving NNIS. Eventually, as the overstory in a timber stand recovers, NNIS that require more open conditions, such as spotted knapweed and Canada thistle, may not flourish. The increase risk of spread and introduction would be a short-term impact. However, the longer the overstory remains open; the habitat remains suitable for sun-loving species and therefore the longer the risk of establishment and persistence exists. As with soil disturbing activities, the project would contain design features to lessen the risk of invasive seeds being introduced into these newly opened areas.

Of the existing roads in the project area, 150.7 miles (38 percent) contain or are within a ¼ mile of an infestation. For the action alternatives, 26.5 miles of existing road are proposed for decommissioning, and along with road closures, the total mileage of open roads in the area would be reduced by 30.4 miles. There are 1.9 miles of open road proposed for decommissioning that are directly infested, which means NNIS are spread along the road-sides of these 1.9 miles. Decommissioning roads would stop motorized traffic, reducing the spread of NNIS seed on those roads. Other vectors such as wind, animals, and birds would still exist. Any infestations on proposed decommissioned roads would effectively slow the spread to adjacent roads by the lack of traffic, following the disturbance caused by decommissioning activities. Decommissioning roads may consist of scattering slash, planting trees, placing large rocks, and constructing berms within the first 300 feet of the roadbed, unless otherwise specified. Closures on decommissioned roads can be illegally bypassed resulting in continued use of decommissioned roads. While there is certainly the potential for the illegal bypass of road

closures, the evaluation of such illegal activity is outside the scope of this analysis. For all action alternatives, new road construction would create new soil disturbance and potentially allow movement of NNIS for the short time those roads would be open. These new roads would be closed after project activities cease, although the corridors would still be intact. Road construction would need to avoid the infestations, and/or the equipment would need to be cleaned before moving on to the next project. At the current time, it would be too late to eradicate existing infestations before project implementation. For Alternative 2, there are 32.8 miles of reconstruction, of which 14.1 miles contain or are within a ¼ mile of NNIS infestations. For Alternative 3, there are 30.7 miles of reconstruction, of which 13.2 miles contain or are within a ¼ mile of NNIS infestations. No road reconstruction is proposed for Alternative 4.

Although monitoring data is unavailable for confirmation, it is reasonable to assume that the existing trend in the project area is one of increasing spread of existing infestations. All action alternatives create habitat conditions suitable for NNIS, which would potentially increase the risk of spread and establishment above the existing background level. Implementation of forest plan guidelines and project design features would eliminate direct spread due to project activities, so the existing trend in the project area would not increase.

3.7.3 Cumulative effects

Cumulative effects are the impact on the environment that results from the incremental impact of the action when added to past, present, or reasonably foreseeable future actions. While the cumulative effects analysis considers sources of NNIS on other ownerships, specific information on land management activities resulting in soil disturbance that may contribute to the spread of NNIS on private, county, or state lands is unknown. Thus, calculating acres of soil disturbance is limited to the National Forest boundary. The analysis area for cumulative effects is the Lakewood-Laona District and includes several other vegetation management projects on the district, relative to the Lakewood Southeast project.

It is unknown when these non-native invasive species became established within the cumulative effects area, but state herbarium records indicate the earliest recorded specimens in the State were in the late 1870's and early 1880's (WDNR 2008). However, the oldest documented infestation from the NNIS database for the Forest is from 1997. Previous activities (timber harvest, road construction and maintenance, early agricultural attempts, recreation, etc.) most likely contributed to the establishment and spread of these species. Since the establishment history of NNIS is unknown and cannot be inferred from existing records, they have been integrated into the existing condition. Thus, past actions are quantified by acres of current infestations, since they are a result of past activities.

Eleven current and foreseeable projects are within the Lakewood Southeast cumulative effects analysis area. The vegetation management projects are considered low to medium risk of spread and introduction, with the NNIS management requirements and mitigation measures integrated into these projects.

Conclusion

All action alternatives would directly and indirectly increase the risk of spread and/or introduction of NNIS. Alternative 2 has a higher risk of spreading NNIS due to more total acres

of harvest than Alternatives 3 and 4. Alternative 3 has a higher risk of establishment and persistence of NNIS based on the larger amount of clearcut harvesting, which can create the higher light conditions favorable to many NNIS species. Alternative 4 has a lower risk of establishment and persistence of NNIS based on the smaller amount of harvest activities and smaller amount of soil disturbance.

Forest plan's standards and guidelines and other management requirements and design features would help minimize the actual potential for NNIS spread and introduction because of project actions. The risk of NNIS spread, introduction, establishment, and persistence would be reduced by vehicle and equipment washing, avoidance of infested sites, and minimizing soil disturbance in infested areas. Therefore, it is not anticipated that the threshold of spreading known infestations due to proposed actions would be exceeded, nor would the project exceed a low risk of new introductions due to the proposed actions.

The effects of implementing one of the proposed action alternatives, when added to the effects of past, present, and reasonably foreseeable actions are not expected to result in appreciable adverse cumulative effects relative to NNIS. This determination is based on the best available science including literature reviews, peer reviews, and ground-based observations.

3.8 Soils

This section is a summary of the Soils Resource Report; it covers background, management requirements, methods, affected environment, and environmental effects.

Background
Soil disturbance caused by heavy equipment used for harvesting or site preparation activities, and prescribed burning may have negative effects on soil physical, chemical, and biological properties and could reduce long-term forest site productivity. Use of heavy rubber-tired or tracked equipment creates risk of soil compaction, rutting, displacement, and erosion. Removal of merchantable tree boles or whole trees (bole plus crown) could affect total site nutrients. If the severity, areal extent, and duration of soil disturbance are great enough to have a negative influence the availability of water, nutrients, and oxygen to tree roots, then the ability of a site to sustain productive forest growth could be reduced.

Potential project action effects to the soil resource are reasonably confined to the soil directly beneath where the activity would take place, such as the operation of machinery to cut and remove trees. For example, heavy equipment causing soil compaction that reduces pore space for air, roots, and water within a portion of one treatment area does not affect pore space on adjacent areas. The removal of nutrients in merchantable tree boles or whole trees (bole plus crown) from one treatment area would not affect total site nutrients on adjacent areas.

Management Requirements
The CNNF goal for soils is to provide desired physical, chemical, and biological soil processes and functions on the CNNF to maintain or improve soil productivity (forest plan, p. 1-4). The FSH for Soil Management in Region 9 (R9) sets soil quality standards (Forest Service, 2005c)

and measurement techniques to determine detrimental soil conditions. Forestwide standards and guidelines for soils (forest plan, p. 2-3) states the CNNF would use the R9 handbook definitions for detrimental disturbance threshold values for soil displacement, erosion, rutting, nutrient loss, compaction, burning, and maintaining ground cover. R9 measurement standards include:

- Detrimental erosion – presence of rills, gullies, pedestals, and soil deposition
- Detrimental displacement – removal of the forest floor and more than 1 inch of surface mineral soil
- Detrimental compaction – soil surface strength and density increase of more than 15 percent
- Detrimental rutting – more than five percent of an activity area has ruts 6 inches deep and 10 feet long
- Detrimentally Burned – entire forest floor consumed down to bare mineral soil, fine roots and organic matter charred in upper 1 inch of mineral soil, soil reddish in color
- Detrimental loss of productivity – a 15 percent reduction in long-term soil productivity based on any combination of the above thresholds, organic matter loss and/or impaired nutrient cycling

Methodology

Measurement techniques defined by R9 (Forest Service, 2005c) are used to measure existing soil disturbance from previous activities. These methods are primarily ocular qualitative assessments that are followed up by quantitative monitoring where management practices appear to have produced unacceptable results.

The indicator of the effects of soil disturbance is the intensity, areal extent, and duration of the impacts for each treatment area. Detrimental disturbance exist when the severity of soil impacts exceeds the R9 measurement standards over a large enough area for a long enough time. At least 85 percent of a treatment area must be maintained in a non-detrimentally disturbed condition to meet national and R9 soil quality standards. If 15 percent or more of a treatment area is in a detrimentally disturbed condition, then the area is considered impaired, unless restoration is successfully implemented. For soils, duration for short-term effects to soil is less than 10 years or the shortest amount of time between harvest entries. Duration for long-term effects is greater than 10 years.

3.8.1 Affected Environment

Action alternatives proposed treatment areas occur within 17 different LTP map units that occur primarily in the Butler Plains (49 percent) and Waupee Knolls (51 percent) Land Type Associations. Topography ranges from nearly level to steep, with about 61 percent of the treatment areas having less than six percent slopes, 35 percent have 6-15 percent slopes, and 3 percent of the areas have slopes ranging from 15-35 percent. Soil surface texture is coarse sandy materials (sand, fine sand, loamy sand, and loamy fine sand) for 90 percent of the treatment areas, and moderately coarse loamy materials (sandy loam, fine sandy loam, very fine sandy loam) for the remaining 10 percent. Soil internal drainage class is moderately well or better for 97 percent of the treatment areas, with less than three percent of the sites having somewhat poor or very poor drainage. The potential for erosion is slight for 97 percent of the treatment areas proposed in Alternatives 2-4, indicating little or no erosion is likely and the potential for erosion

is moderate for three percent of the proposed treatment areas indicating some erosion is likely if mineral soil remains exposed to rainfall.

There are no areas known within the project boundary where land productivity has been permanently impaired due to historical activities (forest plan EIS p. 3-39). On-site monitoring of soil resource impacts within the district has shown no long-term impairment of the land from similar project activities on the same soil types (Forest Service, 2000c, 2001c, 2003a, 2005a, 2006a, 2008a, 2010a, and 2010d). All proposed treatment areas have been field investigated by resource specialists collecting site-specific data for this project, with no existing soil resource concerns identified.

Less than one percent of the areas visited had detrimental soil resource effects remaining from past treatments primarily due to the limited potential for soil compaction and rutting of these dominantly sandy soils. About 46, 41, or 34 percent of the proposed treatment areas in the action alternatives (5,419; 4,395; or 2,219 acres, respectively) have not been harvested in the past 37 years. The remaining 6,288; 6,356 or 4,207 acres in action alternatives respectively, have had one or more previous harvests, as documented in the CNNF timber stand history files. The previous harvests were primarily commercial thinning of red pine with lessor amounts of overstory removal, clear cutting, singletree selection, and improvement harvest of other species. All treatment areas would have had harvests dating beyond the 37 year records.

Currently, more than 99 percent of all acres proposed for treatment within the project area boundary are maintained in a non-detrimentally disturbed condition, with less than one percent conservatively estimated to be detrimentally disturbed as a log landings, main skid trails, fire control lines, or temporary roads from previous management activities. Future trends indicate ground-disturbing activities such as harvesting, road construction, and mechanical site preparation would be reduced over time, as the forest plan is implemented (p. 3-40).

The CNNF has commonly experienced warmer and dryer summer/fall conditions, which have allowed timber sale equipment to operate on normally wet soil types when the ground is not frozen because the soil is dry enough to support the equipment without adverse rutting or compaction. Soils types that are normally restricted to frozen conditions may not be frozen due to a winter thaw, but are very dry due to summer/fall drought allowing timber sale operations to continue with no adverse soil impacts. It is also common in northern Wisconsin for the ground not to be frozen in early December when contract dates indicate frozen ground conditions would normally be expected, thus, operations are not allowed to begin until the ground is frozen enough to support equipment without adverse soil impacts. There have also been winters when no harvesting was allowed on some sites, or when the period of frozen ground was so short as to require extending the timber sale contract by a year or more to allow proper frozen ground conditions to occur. Warmer winter seasons with shorter periods of frozen ground would simply require continued successful implementation of forest plan soils guidelines using site-specific soil resource recommendations, along with timber sale contract administration to protect the soil resource.

3.8.2 Environmental Effects

The "affected area" for analysis of direct and indirect effects of the proposed activities to the soil resource is that portion of a treatment area where activities would take place. Potential effects to the soil resource are reasonably confined to the soil directly beneath where the activity would take place, such as the operation of machinery to cut and remove trees. For example, heavy equipment causing soil compaction that reduces pore space for air, roots, and water within a portion of one treatment area does not affect pore space on adjacent areas. The analysis boundary for cumulative effects would be the land type phase (LTP) within treatment areas for the project.

Alternative 1

Direct and indirect effects

This alternative would have no direct or indirect effects on soil resources from soil compaction, rutting, erosion, displacement or no nutrient loss since no activities involving operation of heavy equipment in the forest are proposed. Existing compaction from previous harvest entries would gradually be mitigated through natural soil forming processes, plant root development, and freeze-thaw cycles (NCASI 2004). Geologic erosion would continue at a minimal rate of less than 0.18 tons/acre/year (Patric 1976).

Natural soil formation processes would continue, biomass would accumulate, organic matter would accumulate and incorporate into the soil surface, and the biological and geo-chemical cycles would continue. Inputs to the system include atmospheric deposition and weathering of parent materials. Annual nutrient balances based on estimated inputs and outputs would tend to increase as succession progresses (Pritchett 1987).

The decommissioning of 23.4 miles of existing road would not be completed as proposed in action alternatives, therefore not returning this land (45 acres, assuming a 14' roadbed) to a productive soil resource.

Action alternatives

Direct and indirect effects

All ratings are for the most limiting season or conditions, before soil protection measures have been assigned. A rating of slight (see Table 3.8.2.1) indicates little or no restrictions are necessary for equipment use, or no rutting or erosion is likely. A moderate rating indicates one or more limitations reduce site suitability for equipment use, ruts are likely without some seasonal restrictions, or erosion control measures may be needed. A severe rating indicates limitations that make equipment use difficult without major seasonal restrictions or special equipment, or the soil would rut readily without operating restrictions, or significant erosion would be expected without costly control measures. Implementing the identified site-specific design features would reduce the potential risk of soil impacts by a minimum of one rating level. Any series of three numbers listed below refer to Alternatives 2, 3, and 4 respectively.

Table 3.8.2.1: This table shows Woodland Equipment Use Rating by Alternative

Soil Disturbance Risk	Alternative 2 Acres (%)	Alternative 3 Acres (%)	Alternative 4 Acres (%)
Slight	12152 (94)	11487 (94)	7580 (93)
Moderate	456 (3)	456 (4)	294 (4)
Severe	365 (3)	312 (2)	232 (3)

Soil compaction and rutting

Potential for soil compaction and rutting from operation of heavy equipment is slight for about 95-96 percent (see Table 3.8.2.1) of the proposed treatment areas that have sandy textured, well-drained soils in the action alternatives. The operating season would be year round, except for periods of excessively wet conditions, such as annual spring thaw or major rainfall events.

Table 3.8.2.2: This table shows Potential for Soil Compaction and Rutting by Alternative

Soil Disturbance risk	Alternative 2 Acres (%)	Alternative 3 Acres (%)	Alternative 4 Acres (%)
Slight	12354 (95)	11689 (95)	7783 (96)
Moderate	254 (2)	253 (2)	91 (1)
Severe	365 (3)	312 (3)	232 (3)

The fine sandy loam soils hold moisture in surface horizons longer and lose strength when near saturation. These soils hold up well to equipment use when dry because as soil moisture content decreases, soil strength increases and compaction potential decreases (NCASI 2004). Therefore, a protective measure restricts the operating season to winter (frozen ground) or dry summer/fall for each treatment area with a moderate rating, to minimize the potential for detrimental soil disturbance. All sites meeting these criteria are identified by "winter or dry summer/fall" in the Recommended Operating Season column of appendix A of the Soils Report.

Potential for compaction and rutting rated severe is due to poor internal drainage on all or a portion of the treatment areas. These soils are wet near the surface year round and a design measure restricts equipment operation to frozen ground only. Of the severe ratings, 212, 212, or 179 acres would only be under-burned with no risk of compaction, and field investigation indicates another 19, 19, or 10 acres would be rated moderate for compaction. This leaves about 134, 81, or 43 acres (one, less than one, or less than one percent) of proposed harvest that requires winter only operation of heavy equipment in Alternatives 2-4 respectively. Five-year results of a long-term site productivity study concluded that harvesting aspen when soils were frozen had little effect on physical soil properties and produced a fully stocked stand of aspen suckers (Stone and Elioff 1998). This research is directly applicable to one aspen and three aspen-white spruce stands (34 total acres) on wet (somewhat poor to very poorly drained) soils that are proposed for thinning in Alternatives 2-4 in this project. Effects to the physical properties of all soils with poor internal drainage are minimized through frozen ground operation of heavy equipment, regardless of forest type. By restricting the harvest operations to frozen ground, the potential risk for compaction and rutting is reduced to slight for these treatment areas. All sites meeting these criteria are identified by "winter only" in the Recommended Operating Season column of appendix A of the Soils Report.

Potential for compaction and rutting is also reduced by operating low ground pressure equipment (tracked harvesters and wide rubber-tired forwarders) over snow, forest floor, logging slash, and surface rock. A Michigan study intentionally tested the latest harvesting equipment on wet, fine sandy loam soil and found no compaction or rutting that exceeded acceptable limits (Miller et al 2001). About 99 percent of the proposed treatment areas in Alternatives 2-4 are on sandy soil types with good internal drainage that provide good support for heavy equipment when the surface is dry, with minimal rutting and compaction risk. While minimizing soil compaction is always the objective across the CNNF, 10-year results from a North American long-term soil productivity experiment, with plots on similar glacial melt-water sands on the Huron-Manistee National Forest in Michigan, indicates that productivity on sandy soil textural classes was enhanced more than 40 percent by severe compaction (Powers et al 2005).

During project implementation, on-site inspections are performed by sale administrators to ensure contract provisions to protect soil resources are enforced. The previous and current CNNF forest plan soils guidelines and soil-specific recommended operating seasons, along with timber sale administration and contract provisions, has been successfully addressing winter thaws for decades. Northern Wisconsin has commonly experienced winter thaws and they are expected and dealt with by CNNF Timber Sale Administrators through timber sale operations shut down per contract specifications.

Main trails near log landings have repeated use by harvesting equipment and therefore, have a higher potential for compaction, depending on moisture conditions if the ground is not frozen. Biomass removal in harvested areas is proposed for 1,549; 1,634; or 0 acres to reduce hazardous fuels and reduce fuel loading for under burning in Alternatives 2-4. Treatment areas where biomass is harvested would have full-length trees, processed treetops, and/or sub-merchantable wood brought to a landing area as part of the harvest operation, or may require a second entry to remove the hazardous fuels if the tree crowns are not sold to the timber purchaser. There would be an increase in soil surface strength and density (bulk density) on the main skid trails from multiple passes of equipment, with detrimental compaction (more than 15 percent increase in bulk density) expected on about one percent (117, 108, or 65 acres) of the harvest areas. Potential for long-term detrimental compaction or rutting is minimized by limiting the operating conditions to dry or frozen ground, and because of the limited ability of these high sand content soils to become compacted. Alternatives 2-4 would be pre-commercially thinned and chipped in place biomass in place reduce hazardous fuels in Alternatives 2 and 3, with no risk of soil compaction. About 50 percent of the shelterwood harvest areas would have a second entry overstory removal harvest within 15 years, as described in detail in the Forest Vegetation Resource Report. Existing landings and main skid trails would be used, with no new detrimental compaction or rutting expected on these sandy, well-drained soils. Soil scientists and resource specialists have monitored harvest treatment areas across the CNNF with the same or similar land type phases/soils. Findings to date indicate no evidence of reduced long-term productivity (threshold values exceeded) due to compaction and rutting (Forest Service, 2000a-c, 2001a-c, 2003a-b, 2004a-b, 2005a-b, 2006a-c, 2007a-d, 2008a-d, 2009a-c, and 2010a-c).

Log landings are primarily located adjacent to haul roads in the road right of way and would be detrimentally compacted during harvest operations. The decking and removal of wood products would occupy about ¼ to ½ acre for each 60 to 80 acres of harvest in most cases, or about 0.4 to

0.6 percent of a harvest unit, and would not add appreciably to the total areal extent of detrimentally disturbed soil. Whole-tree yarding, slashing, and biomass (tree crown and branches) removal may require up to twice the usual area to accommodate all of the equipment and associated activities. Pre-commercial thinning biomass removal would not require a landing area. Some landings would be scarified and re-vegetated, and some would be left to recover naturally.

Proposed miles of new road construction (32' maximum clearing width assumed), which would compact new soil areas and change the land use for less than 10, six, or nine acres of land from productive forest to part of the permanent transportation system used to manage the CNNF. Permanent roads or trails constitute a dedicated use of land for public transportation or hiking. They are considered part of the infrastructure that is required to access and manage the CNNF.

Alternatives 2-4 propose constructing about 0.59, 0.59, or no miles (2 acres, assuming a 28' maximum clearing width) of temporary road at one location (see Appendices B for road identification, length and soil types from the Soil Resource Report). Temporary roads are not part of the permanent transportation system and are subject to soil quality standards. The soil within about a 28-foot wide clearing limit could be detrimentally compacted during construction and the 14-foot road surface would be compacted from repeated hauling of wood products. This would be a short-term effect, as these temporary roads would be decommissioned upon completion of the proposed projects (Forest Service 2004). Decommissioning the new temporary road and existing roads, may involve discing to loosen compaction and/or allow natural processes to eliminate existing compaction over time, returning about 47 acres of land to productive forest.

A maximum of about 11.4, 12.4, or 10.9 miles of bare mineral soil fire control line would be constructed with a dozer blade to contain fire within 2,527, 2,733, or 2,039 acres of prescribe burn areas proposed in Alternative 2-4 respectively. Line width would vary from about two to eight feet depending on whether the blade corner or full blade was used to construct the line. All acres proposed for prescribed fire in Alternative 2-4 are rated slight for soil compaction and rutting risk. There would be no short or long-term detrimental compaction or rutting expected from one or two passes with a tracked dozer or other equipment during fire line construction on these well-drained, sandy textured soils. All constructed mineral soil fire control lines would re-vegetate naturally in one or two growing seasons.

Alternatives 2, 3, and 4 propose to use tractor-attached equipment (salmon blade and roller chop and bracke 510, 598, or 339 acres) to prepare harvested areas for under or full planting. All areas proposed for mechanical site-prep are also proposed for a harvest treatment. Site preparation equipment delivers fewer pounds per square inch to the ground surface than loaded harvest equipment, but does travel about 50-75 percent of a treatment area and has potential for compaction and rutting. All areas proposed for site-prep in are rated slight for rutting and compaction risk due to well-drained, sandy soil types. The same seasonal restrictions assigned for harvesting would limit equipment use to dry ground conditions when soil strength is high, further minimizing risk for soil compaction or rutting from the lighter mechanical site preparation equipment. The salmon blade equipment would actually reduce surface compaction

on main skid trails that are crossed. There would be no short or long-term detrimental compaction or rutting expected from site preparation activities.

In summary, harvest activities would be designed to utilize existing roads, primary skid trails, landings and back in spurs to the extent possible to avoid or minimize soil compaction and rutting across treatment areas. Operating seasons based on soil type would be stipulated in the timber sale contracts and soil moisture conditions and harvest equipment impacts would be monitored by Forest Service timber sale administrators. Harvesting operations would be stopped when soils become saturated to the extent that detrimental compaction and rutting is likely or begins to occur.

There would be long-term detrimental soil compaction on primary skid trails and landings from operation of heavy equipment on about one percent of each harvest area or about 117, 108, or 65 acres, respectively. The extent, intensity and duration of compaction would be minimized for more than 99 percent (12,856; 12,147; or 8,041 acres) of all proposed treatment areas in Alternatives 2-4, through operating requirements, soil protection guidelines, and the low compaction risk of the dominantly sandy soils on project sites. This is a conservative estimate, yet well within Region 9 soil quality standards. Long-term productivity of the land would not be impaired by soil compaction or rutting from the proposed activities.

Soil erosion and displacement

The potential for erosion and displacement (see Table 3.8.2.3) indicates little or no erosion or displacement is likely where mineral soil is exposed to rainfall. These areas have slopes that range up to 15 percent, but commonly have 4-10 percent gradients.

Table 3.8.2.3: This table shows Potential for Soil Erosion and Displacement by Alternative.

Soil Disturbance risk	**Alternative 2 Acres (%)**	**Alternative 3 Acres (%)**	**Alternative 4 Acres (%)**
Slight	12625 (97)	11907 (97)	7869 (97)
Moderate	348 (3)	348 (3)	237 (3)
Severe	0 (0)	0 (0)	0 (0)

Skid trails down short steep slopes, when unavoidable, need to be stabilized with simple erosion control measures such as covering with logging slash or constructing water bars to protect exposed soil until the site is re-vegetated. Slopes may range up to 35 percent, but commonly have 15 to 25 percent gradients. Implementing appropriate erosion control measures for exposed soil on steep slope areas would reduce the potential risk for erosion from moderate to slight.

The forest floor cover, such as ground vegetation, litter, slash, and surface rock protects the soil from erosive forces of raindrop impact and runoff. An undisturbed and totally covered forest soil usually yields no surface runoff, thus, it has no sheet and rill erosion (Dissmeyer and Foster 1980). Tracked or rubber tired harvesting machines and rubber-tired forwarders are used in 90 percent of the tree harvest operations in the project area and the average ground traveled is 11 percent or less of a sale unit for all harvest types (Schumacher 2002). The two machines typically operate on the same trails and run on top of slash generated from the harvested trees, surface rock, and forest floor litter. Potential to expose mineral soil is minimal. Verry (1972)

found no evidence of accelerated erosion after clear-cutting an aspen stand in Minnesota. A few scattered areas (25-50 sq. ft. each) of exposed soil may occur within harvest areas due to maneuvering machines over uneven ground. These isolated areas would re-vegetate naturally within one or two growing seasons and are not an erosion concern. Operation of this type of harvesting equipment does not remove the surface organic or mineral soil layers, thus, soil displacement rarely occurs. About 50 percent of the shelterwood harvest areas would have a second entry overstory removal harvest within 15 years. Existing landings and main skid trails would be used, with no detrimental erosion or displacement expected because all disturbed soil areas would be stabilized as required during and after use to control erosion.

Treatment areas where biomass is harvested would have full-length trees, processed treetops, and/or sub-merchantable wood brought to a landing area as part of the harvest operation, or may require a second entry to remove the hazardous fuels if the tree crowns are not sold to the timber purchaser. Potential to expose or displace additional mineral soil areas during a second entry for biomass removal is expected to be minimal. Removing the fine woody material would not increase erosion potential on these sandy soils with minimal exposed mineral soil, rapid infiltration rates and no overland flow potential. In some types of harvest operations, full-length trees may be pulled to a landing with a grapple skidder, allowing the limbed treetops to drag on the ground. This would cause some mixing of the organic and mineral soil materials; however, it is not considered detrimental displacement (Forest Service 2005c). Ground cover would be maintained and mineral soil exposure minimized on the stabilized sand dunes near Airport road to avoid reactivating wind erosion in these areas designated for Pine Barrens restoration.

Log landings are often located on open areas adjacent to woods roads where the wood is placed directly on the undisturbed ground surface with no potential for erosion. A landing “spur” within or adjacent to a harvest unit, may be approved by the Sale Administrator, when decking wood along the road is not permitted. A spur typically is an area about 40 feet by 100 feet and wood is placed on undisturbed ground, if possible. Some spurs may require clearing of trees, stumps, rocks or other debris. Some soil may be displaced in this process. Potential for soil erosion is very low because level, well drained upland areas are generally designated and natural ground cover would be re-established within one or two growing seasons. Primary skid trails near landing areas would have more exposed mineral soil due to repeated use. These areas would re-vegetate naturally within two growing seasons or be stable with a slash cover or other erosion control measures through the timber sale contract, as needed.

Potential for soil erosion and displacement exists when mineral soil is exposed during the road construction process. All road construction projects follow forest plan guidelines that require utilizing Wisconsin BMPs (WDNR 2010) and Wisconsin Construction Site Best Management Practices Handbook to stabilize disturbed soil during and after use. Forest plan’s standards and guidelines for soil, water, and transportation systems would be followed. No detrimental soil erosion would be expected. Detrimental soil displacement would occur on portions of the new temporary road (0.59, 0.59, or zero miles in Alternatives 2-4) where the organic surface and more than one inch of mineral soil may be bladed off when removing stumps and debris to prepare the roadbed. These temporary roads would be decommissioned upon completion of vegetation management activities and proven soil stabilization practices such as water bars, seeding, and mulching would be applied where appropriate following Wisconsin BMPs (WDNR

2003) and Forest Service Soil and Water Conservation handbook practices (Forest Service 2005d). No long-term detrimental displacement effects to the project area are expected from temporary road construction and use.

Decommissioning 26.5 miles of existing roads is proposed in Alternatives 2-4. The CNNF road inventories show that more than half of the roads identified for decommissioning since 2006 are already physically closed and/or over grown with woody vegetation and would require no ground disturbing closure activity. Some existing temporary roads and the new temporary roads constructed for this project may be disked to loosen compaction, which would expose and displace some mineral soil in the process. However, these sandy soil roads would most likely be allowed to re-vegetate and rely on natural processes to eliminate compaction, returning this land to productive forest over time. In either case, the goal is to stabilize these sites and eliminate erosion potential. Design features would be identified, as needed, to minimize potential for erosion while these sites are stabilized.

Alternative 2-4 propose prescribed burning about 2,527; 2,733; or 2039 acres, respectively, to maintain upland openings, reduce hazardous fuels in the urban interface, restore ecological components and processes of the northern dry forest ecosystem. About 92 percent of the acres proposed are rated slight and eight percent are rated moderate for soil erosion and displacement risk. Fire is the natural disturbance regime of the project landscape, with a history of repeated natural and human caused low to high intensity fires. There has been no observed long-term adverse soil erosion or displacement effects related to the fire history of this landscape, possibly aided by the adapted vegetation's quick response to disturbance (Grossman and Mladenoff 2008). The proposed low to moderate intensity broadcast burning would not totally consume the organic layer, create water repellent conditions, or expose enough mineral soil to allow surface erosion. The organic layer and upper two inches of mineral soil would be displaced to the side of the constructed fire control lines. About 90 percent of the control line miles are rated slight (<15 percent slopes) for potential erosion and displacement, with two percent (1300 feet) occurring on a soil map unit rated moderate (15-35 percent slopes). The displaced organic and mineral soil materials would be pulled back over the exposed mineral soil control line after the burn and water bars would be constructed, if needed, on any short, steep slope areas. These constructed fire control line areas would then seed in naturally to reestablish ground cover within one to two growing seasons. There would be short-term detrimental soil displacement on a maximum of 11, 12, or 10.6 acres of constructed fire control line. No long-term soil erosion or displacement is expected from fire control line construction and use.

Mechanical site preparation to prepare the ground surface for planting or natural regeneration of targeted tree species is proposed for 610, 695, or 436 acres of the harvested areas in Alternatives 2, 3, or 4. Erosion and displacement risk is slight for 100 percent of these site prep areas. The tractor attached equipment that would be used to prepare 50 to 75 percent of the sites for planting or natural regeneration would not expose enough continuous mineral soil for there to be an erosion concern, even on the steeper slope areas. Soils are all well to excessively drained with sandy textures beneath the forest floor organic materials. Infiltration and permeability rates are rapid to moderately rapid in the surface and subsurface layers, indicating water readily enters and moves through the soil, with low run off potential. Equipment used to scarify the surface would cause some mixing of the organic and mineral soil materials, but this is not considered

detrimental displacement (Forest Service, 2005d). Areas where forest floor materials are scraped away exposing mineral soil would be scattered and discontinuous with good infiltration so surface erosion would not be expected, even on the areas with steeper slopes. The exposed mineral soil areas would re-vegetate naturally within one or two growing seasons and no surface erosion is likely.

Geologic erosion would continue at a minimal rate of less than 0.18 tons/acre/year (Patric 1976). Patric (1976) also notes the overwhelming weight of evidence supporting the view that soil losses from responsibly managed forestland are slight compared to those that accompany most other land uses.

In summary, all proposed ground-disturbing activities would be designed to eliminate or minimize potential for soil erosion and displacement. Where possible, avoid operation of heavy equipment up and down any short, steep slopes where exposed soil would readily erode. Locate roads and landings on level ground and stabilize exposed soil on steep slopes during and after use to control erosion.

There would be no short or long-term detrimental soil disturbance effects from soil erosion on project sites or adjacent areas, when forest plan soils and transportation system guidelines are followed. There would be short-term detrimental effects from soil displacement on the project sites where landing areas or temporary roads require clearing of stumps, rocks, and other debris, and along constructed fire control lines. No treatment areas or adjacent areas in the project would suffer long-term impairment of the soil resource from erosion or displacement, if implemented.

Soil Productivity

Soil productivity could be reduced from the proposed activities if excessive organic matter and nutrients were removed through prescribed fire, harvesting, soil erosion, or displacement. Productivity could also be reduced if soil physical properties such as structure or porosity, were impaired by compacting or rutting soil beyond acceptable limits for a treatment area (Forest Service 2005c).

Cutting trees and removing the merchantable bole or whole-tree (bole plus crown) would remove a portion of the treatment area organic matter and nutrients. The ratio and amount of nutrients in tree components (e.g. foliage, branches, bole, bole bark, stump and roots) and thus, the amount removed varies by species, age, stocking, and site quality. Nutrient removal from merchantable bole and bark harvest is not considered excessive, as these nutrients can generally be replaced by mineral weathering and atmospheric deposition (Silkworth and Grigal 1982). Harvest areas retain nutrients in forest floor organic materials (humus layers); mineral soil nutrient capital; tree stumps, decaying root systems, and existing fine and coarse woody debris; top wood stem, foliage and branches (slash), remaining trees (if thinning); shrub and herb layer; and in the 10-15 percent or more of tree biomass that is not removed due to breakage during harvest (Alban and Perala 1990; Grigal 2004).

Whole-tree harvesting removes about 1.75 to two times the nutrients of a bole only harvest (Alban et al. 1978; Federer 1989; Grigal 2004). This would be a long-term productivity concern on coarse textured, nutrient-poor sites (Perala and Alban 1982; Grigal 2000).

The forest plan has a soils guideline to retain logging slash in place (limbing at the stump) where topsoil is less than one inch thick, or where organic matter is less than two percent. This guideline is primarily intended to protect long-term productivity of coarse sandy soils with low nutrient reserves. In addition, the WDNR recently developed Forestland Woody Biomass Harvesting Guidelines (Herrick et al 2009) with the guideline "Do not harvest fine woody material on dry nutrient-poor sandy soils", with jack pine stands as an exception.

Mechanical site-preparation to mix the forest floor organic material with the underlying mineral soil surface horizon, as described in the previous sections, is expected to increase long-term site productivity of the forest community through successful establishment, survival, and growth of the desired tree species. Treatments like harvesting that disturb the forest floor or mechanical site preparation that mix organic layers into mineral soils can lead to a more diverse microbial population for the short-term due to better soil aeration and improvement in substrate quality (Mallik and Hu 1997). There are no short or long-term detrimental effects to soil productivity expected from the mechanical site preparation proposed in the action alternatives.

Of the 1,597 or 1,682 acres proposed for biomass removal in Alternatives 2 or 3, about 525 or 610 acres (33 or 36 percent) are on soils rated acceptable for whole-tree (bole and crown) or biomass harvest. Alternatives 2 or 3 have1,072 or 1,072 acres (67 or 64 percent) that are on the inherently nutrient-poor Menahga sand soil type where the soils guideline would be to leave the tree crowns on-site for nutrient retention. Care was taken to limit proposed biomass removal on nutrient-poor sand soils to only 1,072 acres or about nine or 10 percent of the total proposed harvest and pre-commercial thin acres.

The forest plan soils guidelines and the WDNR biomass harvesting guidelines both allow for modifications when warranted. The WDNR biomass harvesting guidelines state they "may be modified to meet specific management objectives" such as "fuel reduction treatments, barrens/savanna restoration, or prescribed fire" (Herrick et al 2009), and these examples meet the intent of the forest plan soils guidelines. This type of modification or exemption would be warranted for the 1,072 acres of the project stands in WUI or ecological restoration areas that occur on nutrient-poor sand soils, but require hazardous fuels removal to reduce fire risk or to reduce severity of under burning for ecological restoration areas.

Action alternatives proposed miles of new road construction, which would compact new soil areas and change the land use for 10, six, or nine acres of land from productive forest to part of the permanent transportation system needed to manage the CNNF. Proposed reconstruction of 32.8, 30.7, or zero miles of existing roads involves land already removed from the productive land base for transportation and does not constitute a change to soil productivity from this project. Permanent system roads and trails are dedicated land uses and not considered detrimental soil conditions.

New temporary road construction of about 0.59, 0.59, or zero miles proposed in action alternatives would remove about two acres of productive soil resource for the short-term. These temporary roads would be decommissioned and restored to productive land over time, when project activities are completed.

Decommissioning 26.5 miles of existing roads in action alternatives would return about 45 acres (assuming a 14' roadbed) to productive land over time.

Conclusion
Treatments proposed in action alternative would have no long-term direct or indirect detrimental effects to soil productivity of project sites. Long-term productivity of the land would be maintained on more than 98 percent of all treatment areas.

3.8.3 Cumulative effects

Alternative 1
There are no direct, indirect, or cumulative detrimental effects to the soil resource as a result of Alternative 1. The cumulative detrimental effects would remain equal to the past detrimental effects, which are conservatively estimated to be less than one percent (84, 80, or 53 acres) of the Lakewood Southeast Project action alternatives.

Action alternatives
The analysis boundary for soils cumulative effects was determined to be the LTP within treatment areas for the Lakewood Southeast project. LTP are mapped ecological units whose natural boundaries best define site-specific soil resource information on the CNNF. Expanding the cumulative effects analysis area would only serve to dilute the effects to soils from all proposed project activities by including lands with no existing detrimental soil conditions and no present or future plans for treatment. Of the 36,939 acres of the CNNF in the Lakewood Southeast Project Area, about 39, 35, or 23 percent is proposed for activities in Alternatives 2-4, respectively. Another 305 acres are currently being harvested under the Flower Lake Project decision, and 2,214 acres are yet to be harvested under the Plantation II Project decision. This leaves about 54, 58, or 70 percent of the NFS lands in the project area Alternatives 2-4 that do not have potential ground disturbing activities proposed at this time. Since analysis has indicated negligible erosion potential, cumulative impacts to the soil resource in the project area would not affect surrounding LTPs on federal land or land in other ownerships. Potential cumulative effects to the soil resource are reasonably confined to the soil directly beneath where the activity would take place, such as the operation of machinery to cut and remove trees. For example, heavy equipment causing soil compaction that reduces pore space for air, roots, and water within a portion of one treatment area does not affect pore space on adjacent areas. The removal of nutrients in merchantable tree boles or whole trees (bole plus crown) from one treatment area would not affect total site nutrients or long-term productivity of the land on other treatment areas within or adjacent to this project area or other project areas across the CNNF with similar proposed actions. Repeated activities, such as operating heavy equipment or biomass removal, on the same treatment areas and LTPs over time would be analyzed for potential cumulative effects to the long-term productivity of those areas. System roads, trails, and other administrative facilities are dedicated land uses necessary to access and manage the CNNF and are not considered detrimental soil conditions when assessing cumulative affects to soil quality

within or adjacent to the project area. The permanent transportation system on the CNNF continues to be reduced over time. The 2011 Travel Management Project and motor vehicle use map (MVUM) commits a relatively small amount (0.21 percent) of the CNNF land base to motor vehicle use, compared to the 4,656 miles (8,102 acres or .54 percent of the CNNF) that were open to motor vehicles in 2008 (Forest Service 2011). The time span for cumulative effects analysis for the soil resource is the past 37 years. This time period is chosen because the CNNF has data records of harvest activities for this time period that allows consideration of multiple harvest impacts per treatment area. Also, soil impacts, particularly detrimental soil compaction, may take several decades for natural recovery. The period for natural recovery varies by soil characteristics and severity of compaction and while freeze-thaw cycles may hasten recovery, the effects may be assumed to persist for several decades (NCASI 2004).

Past Actions

Numerous historic, natural and human caused ground disturbing events, such as, windstorms, turn of the century (late 1800s to early 1900s) logging and associated fires, road and railroad building, have taken place in and around the area of cumulative effects analysis. While these events have influenced the existing condition of the soil resource, there are no known adverse residual soil resource impacts.

Activities, such as, timber harvesting, prescribed fire, and road building, have occurred over the past 37 years and were implemented following contract operating restrictions, forest plan's standards and guidelines (1986 to present), and site specific design features to mitigate soil resource impacts on Forest Service lands. The CNNF End of Decade Monitoring Report (Forest Service 1998a) and the CNNF Monitoring and Midterm Evaluation Report (Forest Service 2012) covering management activities implemented between1986-1996 and 2004-2010 respectively, indicate no appreciable effects to the long-term productivity of the land or soil resources across the CNNF. About 46, 41, or 34 percent of the proposed treatment areas in Alternatives 2, 3 or 4 (5419, 4395, or 2219 acres, respectively) have not been harvested in the past 37 years. The remaining 6,288, 6,356, or 4,207 acres in Alternatives 2-4 respectively, have had one or more previous harvests, as documented in the CNNF timber stand history files. The previous harvests were primarily commercial thinning of red pine with lessor amounts of overstory removal, clear cutting, singletree selection, and improvement harvest of other species.

All treatment areas would have had harvests dating beyond the 37 year records. On-site monitoring of soil resource impacts within the district has shown no long-term impairment of the land from similar project activities on the same soil types (Forest Service 2000c, 2001c, 2003a, 2005a, 2006a, 2008a, 2010a, and 2010d). Site-specific field monitoring within the project area has verified that there is no long-term impairment (detrimental disturbance is within threshold values listed above) to the soil resource from past activities. Less than one percent of the areas visited had detrimental soil resource effects remaining from past treatments primarily due to the limited potential for soil compaction and rutting of these dominantly sandy soils. As a conservative estimate, less than one percent (84, 80, or 53 acres) of the treatment areas in Alternatives 2-4 would be considered disturbed from any and all past activities, leaving more than 99 percent of the managed soil resource in the proposed treatment areas in a non-detrimentally disturbed condition. Grossman and Mladenoff (2007) found that soil nutrient pools in the northwest Wisconsin sand plain may be resilient to above-ground fire and

clearcutting disturbances within a 26 year timeframe, which directly applies to the Butler Plains (49 percent) and Waupee Knolls (51 percent) sandy outwash plain Land type Associations of the project area.

The CNNF has also implemented Wisconsin Forestry BMPs for Water Quality since 1995 and recent field monitoring indicates that 99 percent of the time there would be no adverse impacts to water quality from soil erosion/sedimentation when BMPs are applied correctly (Cooper et al 1998; Holland 2003; Shy and Wagner 2007). Current conditions indicate key soil properties affecting ecosystem health and sustainability such as porosity, organic matter content and nutrient availability are representative of the natural range of soil conditions inherent to the landscape of the CNNF (Forest Service 1998b; Forest Service 2012). Healthy populations of soil microorganisms such as bacteria and fungi exist in the favorable environment of the forest floor litter layer and soil surface organic matter (Pritchett and Fisher 1987), which would remain in place.

No appreciable long-term effects to the soil resource or long-term productivity of the land from past activities have been identified in the proposed treatment areas for the project.

Present and Reasonably Foreseeable Actions
Lakewood Southeast Project proposed actions that would include soil-disturbing activities. Assessment of potential direct and indirect impacts from activities proposed in these alternatives indicates about one percent of the treatment areas may be detrimentally compacted by heavy equipment, with no other detrimental effects to long-term soil productivity expected. These effects are well below R9 soil threshold values, thus, no appreciable short or long-term detrimental soil disturbance would be expected. Monitoring indicates adherence to forest plan standards and guidelines, site-specific design measures, and contract provisions would eliminate or minimize potential adverse impacts from compaction, rutting, erosion, displacement, or nutrient removal. About 98 percent of the managed soil resource on federal land within the proposed treatment areas would be maintained in a non-detrimentally disturbed condition.

About 305 acres are currently being harvested under the Flower Lake Project decision, and 2,214 acres are yet to be harvested under the Plantation II Project decision within the project boundary. Soil Resource effects (direct, indirect, and cumulative) have been considered for these projects, no detrimental long-term effects to soil productivity have been identified, and none of those harvest activities would occur on the same sites as proposed in the project; therefore, those projects are considered outside of the soil resource cumulative effects area for the project.

The forest plan FEIS soils effects analysis on page 3-82 stated that of the 1,494,000 acres of CNNF land, 1.3 percent to 1.5 percent is projected to have potential ground disturbing activities proposed annually through the first decade for all alternatives, leaving more than 98.5 percent with no disturbance, and 85 percent undisturbed over the decade. The actual average annual harvested area from 2004-2010 was 8,990 acres, or .6 percent per year. This was less than ½ the predicted amount, leaving 99.4 percent undisturbed annually and 95 percent undisturbed over the first decade if the trend continues for the next three years.

While there is a potential emerging interest in wood-based bio-energy in northern Wisconsin, to date the demand for woody biomass from the CNNF has been very low, accounting for less than three percent of the annual total wood volume harvested from 2007-2010 (St. Pierre et al 2011). Leaving logging slash on-site remains the common practice for all types of harvest on the CNNF. There would be no detrimental cumulative effects to the soils/LTPs expected from the biomass removal proposed by this project because there have been no known detrimental effects identified from past harvest actions, and no predicted detrimental direct or indirect effects from biomass removal activities proposed in Alternative 2 or 3 of this project. All other CNNF projects that would allow some biomass removal, such as Park Falls Hardwoods, Washburn Red Pine Thinning, or Early successional Habitat Improvement, occur on different LTPs than the project, and would have no potential direct, indirect, or cumulative effects to the soil resource specific to the project area. Soil resource reports completed for all CNNF projects that allow some amount of whole-tree removal to date have found there would be no detrimental cumulative effects to the soil resource or long-term productivity of the land from whole tree (bole plus crown) removal. This is when site-specific woody biomass harvesting guidelines are followed, including restricting susceptible soils and retaining recommended amounts of fine woody debris to maintain total site nutrients. Any future proposed whole-tree removal from treatment areas that have had past whole-tree harvests would be evaluated for potential cumulative effects of multiple biomass harvests on total site nutrients with consideration for the latest site-specific soil guidelines and research findings.

No direct or indirect effects to long-term soil carbon storage were identified in this project analysis. Soil organic carbon was also assessed in the forest plan FEIS (Forest Service 2004c), which indicates through the literature cited that the CNNF would continue to be a carbon sink. Little to no change in soil carbon could be expected after all types of forest harvesting proposed, and projects an increase in soil carbon storage through implementation of the forest plan. More recent studies specific to Wisconsin forests indicate the CNNF to be a net sink of carbon, even after accounting for all associated emissions (Gower and Ahl 2006). Ten year results from a North American long-term soil productivity experiment, with harvest plots in Minnesota and Michigan, indicate when forest floors are retained there is no general decline in soil carbon with time. Slash removal does not reduce soil carbon storage to 30 cm through 10 years, and the primary inputs to soil carbon come from the decay of fine roots that remain from the harvested stand, not the logging slash (Powers et al 2005). Soil organic carbon would be increased initially on all harvest treatment areas for Alternatives 2-4, due to the decaying roots systems of the harvested trees, with no cumulative effects expected from the activities proposed in any alternative.

No other projects are currently being planned within the project boundary. No appreciable long-term effects to the soil resource or long-term productivity of the land from present and reasonably foreseeable actions have been identified in the project area.

At this time there are no other specific actions known to be planned within the Lakewood Southeast Project Area of cumulative effects analysis for the soil resource. Future trends indicate ground-disturbing activities such as harvesting, road construction, and mechanical site preparation would be reduced over time as the forest plan is implemented.

Consistency with the Forest Plan
All alternatives comply with the forest plan direction pertaining to the soil resource.

Conclusion
The effects of implementing one of the action alternatives when added to the effects of past, present, and reasonably foreseeable actions would not be expected to result in appreciable adverse cumulative effects to the quality of the soil resource in the project area.

Table 3.8.3: Summary of direct, indirect, and cumulative soil detrimental disturbance

Soil Resource Impacts	Alternative 1 Acres (%)	Alternative 2 Acres (%)	Alternative 3 Acres (%)	Alternative 4 Acres (%)
Total treatment Area	0	12973	12255	8106
Direct and indirect long-term detrimental disturbance (predicted)	0	117 (<1)	108 (<1)	65 (<1)
Past detrimental disturbance	84 (<1)	84 (<1)	80 (<1)	53 (<1)
Cumulative detrimental disturbance	84 (<1)	201 (<2)	188 (<2)	118 (<2)
Long-term productive soil resource	12889 (>99)	12772 (>98)	12067 (>98)	7988 (>98)

3.9 Water Resources

This section summary from the Water Resource Report would analyze the impacts to water resources from this project. It includes background, management requirements, methodology, affected environment, environmental effects, consistency with the forest plan, and conclusion.

Background for water quality
The water quality of lakes and streams could be negatively affected because of forest management activities if sedimentation were to occur. Sediment yield is the amount of sediment transported from an area, usually from a watershed via a stream. Fine sediment is a particular water quality problem in streams because it can reduce: (1) available habitat by filling pools; (2) survival of fish eggs and fry; and (3) survival, composition, and abundance of aquatic invertebrates (Waters 1995; Cordone and Kelly 1961). Sedimentation can also affect channel morphology (form and structure) by increasing width/depth ratio and reducing sinuosity

(winding and bending) (Rosgen 1994). Sand sediments in particular are associated with increased width and reduced depth (Heede 1980).

Potential effects on fisheries could occur as a result of changes in water quality or loss of habitat through direct stream disturbance or removal of potential sources of large woody debris. Aspen regeneration immediately adjacent to the stream (within 300 - 450 feet) could have an indirect effect on the streams by encouraging beaver colonization, which can affect water temperature, sediment transport, and channel morphology. Increases in water temperature of streams and small ponds can occur when the shade that adjacent vegetation provides to the water body is completely removed. The additional sunlight can warm the water by a few degrees, which can cause cold-water communities to be negatively affected.

Riparian areas provide large woody debris for the aquatic and terrestrial portions of the riparian area, soil and bank stability, diverse and productive sites for aquatic and terrestrial plants and animals. Maintaining healthy riparian ecological function provides for macroinvertebrate and fish habitat, as well as, stable banks and channel morphology for water quality.

Roads can disrupt aquatic systems in a variety of ways, particularly at stream crossings, roads within riparian areas and roads through wetlands. Culverts can be undersized resulting in frequent washouts, ponding upstream, poor fish passage, and habitat degradation. Roads that cross wetlands can result in changes in the wetland hydrology, particularly when there is not adequate cross drainage.

Management requirements from the laws, Forest Service Manuals, and forest plan
Section 208 of the 1977 Clean Water Act required states to develop plans and procedures to control non-point sources of pollution, including silvicultural sources, to the extent feasible. Additionally, section 319 of the 1987 Clean Water Act requires each state to develop and implement a program to reduce non-point source pollution to the "maximum extent practicable." The act requires that BMPs control non-point sources of water pollution.

Most Forest Service policy regarding water quality is contained in Forest Service Manuals 2532 (Water Quality Management) and 2522 (Watershed Improvement). The primary objective for water quality management is to protect, and where necessary, improve the quality of the water resource consistent with the purposes of the National Forests and national water quality goals. The policy includes promoting and applying approved BMPs to all management activities as the method for control of non-point sources of water pollution and for compliance with state and national water quality goals; establishing goals and objectives for managing the quality of the water resource in land and resource management plans; and producing water of a quality suitable for the beneficial uses identified in the land and resources management planning process. Desired conditions for water resources from the forest plan include:

- Goal 1- Ensure Healthy and Sustainable Ecosystems (p. 1-2)
- Goal 1.3 - Aquatic Ecosystems (p. 1-2)
- Objective 1.3e - Improve or restore aquatic/riparian habitat in streams and lakes (p. 1-3)
- Objective 1.3g -Protect and restore coldwater stream communities by maintaining Class I, Class II, and segments of Class III trout streams and their tributaries in a free-flowing condition (p.1-3)

- Goal 1.5- Conserve habitat capable of supporting viable populations of existing native and desired non- native species, and retain the integrity and function of key habitat areas (p. 1-4)
- Objective 1.5 b -Cooperate with the WDNR to establish a population and distribution of beaver across the forest that provides naturally occurring disturbances, through flooding and direct impacts on vegetation, important to ecosystem sustainability. Juxtapose this population and distribution on the landscape in a manner that avoids detrimental effects on roads, trails, and other critical resources such as cold-water fisheries and rare species(p. 1-4)
- Standards and guidelines for aspen and beaver management (p. 2-17)
- Standards and guidelines for Watershed Protection and Management p. 2-1,2; Riparian Areas p. 2-2; Wetlands p.2-3; Woodland Ponds p.2-15; Fisheries Habitat Management 2-16, 17.

Methodology of analysis

This water resource effects analysis utilized all available aquatic ecological classification and inventory, water resource information, current research, and professional judgment of resource specialists. Lakes, streams, ponds, riparian areas, and wetlands within and adjacent to proposed treatment areas have been identified. Additionally, the IDT deferred many stands early in the analysis due to a variety of reasons, one of which related to their location relative to various water resources. In many cases, the IDT adjusted stand boundaries to exclude wetlands, streams, lakes, and ponds from the treatment area.

The analysis looked at water resources within the project area from a watershed scale to assess potential cumulative effects. It used seven sixth level hydrologic unit code system watershed boundaries that lie within and outside the project area for the cumulative effects boundary. The analysis used these boundaries because this watershed size would provide the most comprehensive boundary when analyzing the cumulative effects to water quality from the proposed treatments. Long-term effects are those expected to last longer than one year after treatment or mitigation completion, while those expected to last less than one year are short-term. Boundary distances and short verses long-term effects criteria were chosen to be consistent with the BMPs.

Also included in this analysis are the potential effects from the Flower Lake Project and Quad County Tornado Salvage. These project boundaries overlap the project area as well as the cumulative effects boundary.

This analysis considered treatment areas with boundaries within 100 feet of the water resources. The forest plan did not define quantitative thresholds for water quality; it implies a general, forest-wide protection to provide for ecologically healthy streams, riparian areas, lakes, and wetlands. These standards specifically require protection of hydrologic function and maintenance of natural hydrologic regimes in aquatic ecosystems. These standards also design and maintain activities that could affect water quality in accordance with the BMPs (forest plan p. 2-1 thru 3). An effect to water quality would exceed the threshold if long-term impacts would occur. Short-term effects would not exceed the threshold.

Threshold

Peak flow

The potential effect of proposed aspen clearcutting on hydrology was evaluated by determining the proportion of one-sixth level watershed that would be harvested and in an open condition. The select sixth level watershed represents a worst case scenario. The open areas were compared to thresholds for potential increases in peak snowmelt and storm flow runoff that could affect stream channel morphology, sediment yield, and aquatic habitat. The selected thresholds were greater than 60 percent of a watershed in an open condition (forest less than 15 years old, non-forest upland, non-forest wetland) for snowmelt runoff and greater than 35 percent upland in an open condition for storm flow runoff (forest less than nine years old, non-forest upland) (Verry et al 1983).

Riparian Management Zones (RMZs)

Treatment areas with boundaries within 100 feet of the water resources (above) were considered in this analysis. One hundred feet is the largest riparian management zone (RMZ); designated trout streams, (regardless of width), streams three feet wide and wider, as well as lakes have a 100 feet RMZ while streams less than three feet wide and streams less than one foot wide have a 35 feet RMZ. The RMZ widths are identified in Wisconsin's BMPs for Water Quality. The RMZ is an area where management practices are modified to protect water quality, fish, and other aquatic resources. The water resources within the project area were also looked at from a watershed scale to assess potential cumulative effects.

Aspen No Regeneration Zones

The current forest plan's standards and guidelines intention is to serve as best management practices for the protection of water quality in compliance with the Clean Water Act. Forest plan includes no aspen patches regenerated within 450 feet of selected Class I, II, and segments of Class III trout streams including their tributaries and spring ponds. Also, no aspen patch regeneration within 300' of all other Class I and II trout streams including their tributaries and spring ponds. Manage vegetation within these zones for species other than aspen, preferably long-lived conifers and hardwoods (forest plan p. 2-17).

3.9.1 Affected Environment

Sediment yields in Wisconsin range from a low of less than 10 tons/square mile/year to a high of 100-500 tons/square mile/year to a (Hindall 1976; Hindall 1972; Hindall and Flint 1970). The highest sediment yields occur in the hilly terrain with mixed forest and agriculture in the southwestern part of the state and the red clay region near Lake Superior. The lowest yields occur in the forested areas of northern Wisconsin including the CNNF. These low yields occur for three reasons. First, erosion and sediment yield from timber harvest areas is usually low. This is because ground cover is often provided by residual vegetation, logging slash, and rapid re-growth of vegetation (Very 1972; Spangenberg and McLennan 1983). Second, timber harvest and other forest management activities typically only affect a small portion of the area in any given year. For example, on the CNNF, timber harvest has occurred on 1.6 percent of the land each year over the last decade (USDA Forest Service 1998). Third, even when erosion does occur it frequently is not delivered to streams because of the low relief and undulating terrain (Verry 1972).

The Lakewood Southeast area lies within seven sixth level Hydrologic Unit Code (HUC) sub-watersheds. On average, all delineated sixth level watersheds encompass approximately 10,000 to 40,000 acres. National Forest ownership within the seven sixth level watersheds ranges from 3-80 percent. National Forest ownership is important because it determines the degree of influence the CNNF will have in any particular watershed (forest plan, FEIS p 3-5).

The analysis area for this section is the sixth level watershed scale. This watershed scale includes extensive timber harvests of the late 1800s/early 1900s, recent (within the past several decades) red pine plantation management activities within riparian areas and natural disturbances such as beaver activity have created a general lack of large, mature long-lived trees and/or tree species diversity in some riparian areas. In addition, historical log drives cleared wood from streams and lakes to make rivers suitable for log drives. Because of this, past activity most of the riparian areas across the forest are relatively young with over ½ the upland acres in short lived species (forest plan FEIS). To maintain appropriate riparian structure and function, manage riparian areas for tree species diversity, large trees, and shade where soils permit. Among other things, this would provide for terrestrial wildlife habitat, long-term large woody debris recruitment to aquatic and terrestrial portions of riparian areas, soil and bank stability, water temperature control, and riparian area microclimate moderation.

There are 19 named lakes within the project area. A desired condition for riparian corridors bordering streams, and lakes is that their structure, function, and composition are intact and serve as landscape connectors. The upland terrestrial component of riparian areas would consist of large long-lived, tall trees appropriate for the site that provide shade, debris, large woody debris, shoreline and bank stability, and overhead cover. Desirable species include white and red pine, hemlock, northern white cedar, and to a lesser extent white spruce, red oak, sugar maple, and red maple (forest plan).

RMZs

In the Lakewood Southeast Project Area, there are a total of 3,294 acres within the riparian management zones (RMZs). The continued regeneration of early successional species like aspen within the riparian area has resulted in providing ample supplies of the preferred food source for beaver. Beaver can adversely affect trout habitat by blocking migration, reducing shade through flooding, increasing water temperature, causing sedimentation of spawning areas, and altering habitat, which causes increased competition from other fish species (USFS 2002).

In the project area, there are a total of 3,294 acres within the RMZs. RMZ widths identified in Wisconsin's Forestry BMPs for Water Quality manual were used for this analysis. The RMZ is an area where management practices are modified to protect water quality, fish, and other aquatic resources.

Trout Streams

The continued regeneration of early successional species like aspen within the riparian area has resulted in providing ample supplies of the preferred food source for beaver. The CNNF has over 1,200 miles of stream designated as trout water. Significant efforts have been made over the last two decades to restore the cold-water community, particularly to maintain free-flowing conditions. Part of this effort has been to reduce the amount of aspen next to trout streams to

discourage beaver activity within those streams. There are nine classified trout streams within the project area. Streams within the CNNF have been classified using the WDNR trout stream classification systems from the forest plan, see Table 3.9.1.

Table 3.9.1: Table showing the no aspen regeneration zone

Stream in the Lakewood Southeast Project Area	**WDNR trout stream class from the forest plan**	**No aspen regeneration zone in feet from the forest plan**	**Beaver control**	**Acres in the no aspen regeneration zone**
Hines Creek	I	450	Y	370
Bonita Creek	I	450	Y	129
Forbes Creek & Hay Creek	I	450	Y	787
Waupee System (includes Baldwin, Little Waupee, and Waupee below McCauley Creek)	I	450	Y	1501
MaCauley Creek	I	300	Y	167
North Branch Oconto River	II	300	N	69
South Fork Thunder River	None	None	Y	0
Waupee Creek (from McCauley Creek to Waupee flowage)	I (McCauley to old Hwy 64); II (old 64 to mouth); III (Headwaters to McCauley Cr)	300	Y	263
West Branch Peshtigo Brook	None	None	N	0

Wetlands

According to the Wisconsin Department of Natural Resources (1993) wetland coverage map, there are a total of 10,883 acres of wetland occurring on National Forest lands within the Lakewood Southeast project area. This does not include all of the small isolated wetlands within the project boundary. Some wetlands are very small and they are not easily identified. Approximately 85percent of these acres are considered forested wetland with 12 percent in shrub type. Wetlands are those areas that are inundated by surface or ground water with frequency sufficient to support, under normal circumstances, vegetation, or aquatic life that requires saturated or seasonally saturated, soil conditions for growth and reproduction (Forest Service Manual - FSM 2527.05).

Roads

The CNNF landbase including the project area is well roaded. Many of these road corridors have been in place since the early logging days. Roads can disrupt aquatic systems in a variety of ways, particularly stream crossings, wetlands, and riparian areas. Culverts can be undersized resulting in frequent washouts, ponding upstream, poor fish passage, and habitat degradation.

Roads that cross wetlands can result in changes in the wetland hydrology, particularly when there is not adequate cross drainage.

3.9.2 Environmental Consequences

The "affected area" for analysis of direct and indirect effects of the proposed activities to aquatic resources (Issue B) is the RMZs located within the project area. The analysis used RMZ widths identified in Wisconsin's Forestry BMPs for Water Quality manual for this analysis. The RMZ is an area where the IDT modified management practices to protect water quality, fish, and other aquatic resources.

Riparian ecosystems play a critical role in the health of aquatic ecosystems (streams, lakes, and ponds). Along streams, they provide shade to maintain cold or cool water temperatures. They provide the primary food source for headwater streams in leaf litter and detritus (dead organic matter). Detritivores consume detritus, which include many bacteria and fungi and aquatic invertebrates such as worms and insects. Aquatic insects, for instance, shred dead leaves, but also consume bacteria and fungi growing on the leaves. They provide storage for floodwaters. Along lakes, streams and wetlands, riparian ecosystems act as filter strips to remove non-point water pollutants. Riparian ecosystems are also important wildlife habitats and recreation sites.

Alternative 1

The riparian areas would have no conversion to long lived species and roads located through wetlands or that cross streams would remain in place. There would be no direct or indirect effects to peak flow.

Riparian management zone

If this alternative would be implemented, the long-term health of these riparian areas may be affected as there would be no conversion to long lived species in these areas. Overtime, these areas would naturally convert to other species that may not be favorable to the long-term health of the riparian ecosystem. Riparian areas provide large woody debris for the aquatic and terrestrial portions of the riparian area, soil, and bank stability, diverse and productive sites for aquatic and terrestrial plants and animals. Maintaining healthy riparian ecological function provides for macro-invertebrate and fish habitat as well as stable banks and channel morphology for water quality.

Trout stream riparian areas- No aspen regeneration zones

If the District implemented the No Action Alternative, the aspen habitat along these streams would remain a favorable food source for beaver. Removal of vegetation along riparian areas from beaver activity has the potential to increase water temperatures as well as reduce soil and bank stability creating an increase in sediment transport and impacting the overall stream channel morphology. As a direct effect, flooding would have the potential to destroy riparian vegetation and deposit sediment.

Road activities in RMZs and wetlands

Roads that are hydrologically connected to wetlands and streams would not be decommissioned. These roads may contribute sediment or alter the hydrologic function of the connected wetlands and streams. Roads that are open and dead end or are located within the RMZ of wetlands and

lakes have the potential to encourage off-road vehicle use. These activities may cause resource degradation, but there are forest plan's standards and guidelines developed to help reduce off-road use and preserve hydrologic function as well as overall integrity of aquatic ecosystems.

Action alternatives

Peak flow

This analysis used Alternative 3 since it includes the largest acreage of proposed aspen clearcuts. This analysis indicates that adverse impacts to hydrology and water quality are very unlikely because of the proposed aspen clearcuts. Waupee Creek, representing the worst-case scenario, did not approach the thresholds for either snowmelt (>60 percent) or rainfall (>35 percent) runoff. The proportion of the sixth level watershed with an open canopy totaled less than 11 percent for snowmelt runoff and less than six percent for rainfall (see table below). Increases in peak flows caused by timber harvesting for both snowmelt and rainfall are limited to more frequent flood events. Major flood peaks are generally not affected by timber harvest because the volume of runoff far exceeds the volume of soil water storage that is affected by timber harvest and subsequent changes in evapotranspirational losses. Therefore, increases in peak flow rates caused by timber harvesting are generally limited to floods with recurrence intervals less than 25 years (Verry 2000).

Table 3.9.2.1: Peak Flow-Harvest Analysis for Waupee Creek sixth level Watershed

Vegetation Class	**Waupee Creek**
Proposed CC (ac)	1089
Forested, Upland (ac)	21,642
Forested, Wetland (ac)	6604
Non-Forest, Upland (ac)	618
Non-Forest, Wetland (ac)	1584
Water (ac)	620
Total Watershed Area (ac)	32,157
Open-Snowmelt (ac)	3291 (10.8%)
Open-Rainfall (ac)	1881(5.8%)

Riparian management zone

Approximately up to 225 RMZ acres (or seven percent of total RMZ acres), 167 acres (or five percent of total RMZ acres), and 77 acres (or two percent of total RMZ acres) in Alternatives 2, 3, and 4, respectively. In addition, Alternative 2, 3, and 4 propose 62 acres (1.8 percent of total RMZ acres) of under-planting after thinning or shelterwood harvests, 56 acres (1.7 percent of total RMZ acres) and 23 acres (0.7 percent of total RMZ acres). A summary of proposed harvests and other activities is listed in the table below. Although all of the action alternatives propose harvest activities as well as under-plantings within RMZs, Alternative 2 would provide the most opportunities to promote the long-term health of riparian areas, as there would be 62 acres of under-plantings completed after thinning or shelterwood harvests.

Table 3.9.2.2: Action alternatives-summary of proposed harvest acres located in RMZs

Proposed Harvest Treatment	Alternative 2	Alternative 3	Alternative 4
Clearcut	12	12	0
Selection	3	3	0
Shelterwood	84	75	25
Thinning	126	77	52
Under-plant	62	56	23
Under-burn	3	3	2
Salmon blade	1	1	1
TSI	16	12	4

Treatments proposed in each alternative that are adjacent to riparian areas would follow BMPs for water and wetland quality, as well as forest plan's standards and guidelines for wildlife, fish, soil, and water resources. The proposed treatment types near water bodies are primarily thinning harvests in pine and aspen stands to promote the succession of red pine and white pine present or under-planted in the stands. Impacts to water quality are negligible from these types of harvests when project designs features are properly implemented and maintained. Selection harvests expose a minimum amount of soil and vegetative cover does not change (Spangenberg and McLennan 1983). In general, the stands that propose clearcut harvest methods contain small sections that cross into RMZs, on average less than three RMZ acres/harvest units. Sedimentation would not be expected to occur for lakes, designated trout streams, and streams three feet wide and wider. This is because equipment operations would not take place a within 15 feet of the ordinary high water mark (except on roads or at stream crossings) for these water bodies.

Wheeled or tracked equipment operation within 15 feet of one side to 15 feet on the other side of the stream's ordinary high water marks would occur only when the ground is frozen or dry. For streams less than three feet wide and less than one foot wide, wheeled or tracked equipment operation within 15 feet of the ordinary high water mark would only occur during dry or frozen ground conditions.

At least 60 basal area is required to be left within 100 feet of the high water mark of lakes, designated trout streams, streams three feet wide and wider, and within 35 feet of streams less than three feet wide. Erosion and sediment yield from timber harvest areas is usually low because residual vegetation often provides ground cover, logging slash and rapid re-growth of vegetation (Verry 1972; Spangenberg and McLennan 1983). Erosion, even when it does occur, it frequently is not delivered to waterbodies because of the low relief and undulating terrain, which is quite typical of the project area (Verry 1972). Project design features, which include BMPs and forest plan standards and guidelines, when properly implemented would ensure that project activities would not cause long-term impacts to water quality.

Forest plan standards and guidelines, which incorporate Wisconsin's BMPs, are part of the proposed action and alternatives; therefore, effects analysis is based on their implementation. The Forest Service Handbook 1909.15, chapter 10, section 15 states: "For each alternative

considered in detail, analyze and document the environmental effects including the effectiveness of the mitigation measures …"

Proposed treatment areas would be monitored during project implementation to ensure contract specifications and design features are followed. The effectiveness of the proposed design features is based upon monitoring results complied from the WDNR. During the mid-1990s, the Forests also participated in the development of "Wisconsin's Forestry Best Management Practices for Water Quality" (WDNR 2010) and support their use to minimize sediment and other non-point sources of water pollutants. The use and effectiveness of BMPs across all land ownerships in Wisconsin, including the National Forest, was monitored by interdisciplinary and interagency teams, during the years of 1995 to 2006. BMPs have been applied correctly a vast majority of the time when needed and these have been extremely effective in protecting water quality. The field evaluations indicated that 99.9 percent of the time no adverse impact to water quality occurred when a BMP was applied correctly where needed. The most recent monitoring, 2006, was conducted on Federal and Industrial timber sales. Twenty-eight timber sales were monitored throughout the CNNF. Application of RMZ BMPs increased significantly from 1995-2006. In 1995, RMZ BMPs were applied correctly were needed 79 percent of the time and this increased to 94 percent in 2006. According to the 2010, Wisconsin Statewide Forest Assessment the WDNR BMP program is considered a success as studies have shown that silviculture is not a significant source of water quality impairment in Wisconsin.

WDNR research division is currently conducting a research project entitled "*Effectiveness of Riparian Management Zone Best Management Practices for Preserving Stream Health in Timber Harvest Areas*." The objective of the study is to determine if there are any meaningful changes to stream habitat, fish and macroinvertebrate assemblages, after vegetative treatments that utilize Wisconsin BMPs for water quality. Preliminary results suggest that they have not been able to detect significant changes in composite habitat and fish measures after harvesting under existing BMP guidelines. The study is ongoing.

Project Area BMPs

As part of the 2006 WDNR BMP monitoring effort, three sales (out of 30 total federal BMP monitored sales) were located within the cumulative effects analysis area for Lakewood Southeast. The sales were located along Forbes Creek (T33N, R17E, Sections 35 and 36), Chute pond (T31N, R16E, Section 35), and one small wetland (T31N, R17E, Section 29). Monitoring results indicated that all BMPs were applied correctly. Monitoring team comments indicated that the sale layout/activities implemented excellent stream protection; where some areas the RMZ was extended to the top of slopes. RMZ harvest activities also favored long-lived species and no equipment operation took place within 50 feet from the stream (Shy and Wagner 2007).

Appendix D identifies forest plan's standards and guidelines and additional design features that were determined to be needed for projects being considered in this analysis. Both forest plan's standards and guidelines with the additional design measures are an integral part of each of the action alternatives and are meant to meet or exceed BMPs for water quality.

Prescribed burning
Prescribed burning actions proposed that are adjacent to riparian areas would follow the prescribed burning BMPs identified in the WDNR BMP handbook. There are four stands where a stream intersects the proposed burn units.

In general, erosion responses to burning are a function of several factors including degree of elimination of protective cover; steepness of slope; climatic characteristics, and rapidity of vegetation recovery. The District would carefully plan fire line locations to consider weather, fuel, soil, and topographic conditions in the burn area to minimize impacts on water quality. Numerous proposed burn units would use a wetland boundary as the fire line break; this would eliminate the need to construct a fire line break with a dozer adjacent to wetland boundaries. There would be no wetland acreage located within the burn unit.

Biomass harvest
Biomass harvests would not occur within 50 feet of the ordinary high water mark for lakes, designated trout streams, and streams three feet wide and wider and 15 feet of the ordinary high water mark for streams less than three feet wide and streams less than a foot wide.

Treatment areas where biomass is harvested would have full-length trees, processed treetops, or sub-merchantable wood brought to a landing area as part of the single entry harvest operation. The WDNR recently developed Forestland Woody Biomass Harvesting Guidelines (Herrick, et al 2009), where proposed harvest units would retain and scatter tops and limbs (less than four inches in diameter) from 10 percent of trees in the general harvest area (e.g. one average-sized tree out of every 10 trees harvested). Minimize potential for long-term detrimental water quality due to ground cover providing residual vegetation, logging slash, and rapid re-growth of vegetation. In addition, if erosion would occur, it frequently is not delivered to water bodies because of the low relief and undulating terrain, which is quite typical of the project area. Harvest treatments would follow BMPs for water quality.

Trout stream - No aspen regeneration zones
Alternative 2 provides the most opportunities for conversion to long lived species within the riparian area as 189 acres are proposed for thinning, which also includes under-planting 42 acres with conifer species after harvest activities. Thinning and under-planting after harvest activities would promote the growth and retention of long-lived species within riparian areas. See table below for a summary of harvest activities located within Aspen No Regeneration Zones.

Table 3.9.2.3: Summary of aspen harvests located within the aspen no regeneration zones.

Proposed Harvest Treatment	**Alternative 2**	**Alternative 3**	**Alternative 4**
Clearcut	6	10.7	2.5
Shelterwood	0.98	0	0
Thinning	189	15	53
Under-plant after harvest	42	3	33

Although GIS identified aspen type stands proposed for clearcuts in 'No Aspen Regeneration Zones', field layout crews would avoid those buffer zones when marking aspen clearcut

boundaries. In general, the IDT found less than three acres/stand in those buffer zones; one was nine acres.

The analysis does not show expected long-term detrimental water quality effects to occur from sedimentation, water temperature increases, or lateral sub-surface flow in wetlands when following the project design features and because of the nature of the project locations. Overall, the proposed harvest treatments in Alternative 2 would best achieve forest plan's goal 1.3e, "Improve or restore aquatic/riparian habitat in streams and lakes" (forest plan, p.1-3).

Road activities in RMZs and wetlands
Approximately 14 miles of roads are adjacent to or are located within wetlands and 4.4 miles are located within RMZs. In the action alternatives, up to one mile (seven percent of roads located within wetlands) of roads that crosses through wetlands would be decommissioned. Roads that cross streams and are proposed for decommissioning, road construction, or temporary road construction for action alternatives include:

- FR 9421120 crosses unnamed tributary to Waupee Creek- decommission
- FR 942316 crosses unnamed intermittent tributary to a wetland- decommission
- From Sunrise Lake to Macaulay Creek- decommission the FR 942150 where ATV use is located along the lake
- CON10 crosses intermittent tributary to Hines Creek- would be temporary access with a bridge or temporary stream crossing (this activity would be dropped in Alternative 4)

The roads recommended for decommissioning or temporary access would be designed with proper cross drainage to maintain hydrologic function across the landscape. All appropriate permits needed from the Army Corps of Engineers and WDNR would be obtained prior to construction activities when needed. This may include Clean Water Act NPDES permit for storm water discharge.

3.9.3 Cumulative effects

The timeframe for this analysis starts in the 1800s and continues into the future. The geographical boundary is seven sixth level watersheds, both in and outside the project boundary. The No Action Alternative has no direct, indirect, or cumulative effects to aquatics resources.

The "affected area" for analysis of direct and indirect effects of the proposed activities to aquatic resources is the project area. RMZ widths identified in Wisconsin's Forestry BMPs for Water Quality manual were used for this analysis. The RMZ is an area where management practices are modified to protect water quality, fish, and other aquatic resources. The water resources within the project area were also looked at from a watershed scale to assess potential cumulative effects. Seven sixth level hydrologic unit code system (HUC) watershed boundaries that lie within and outside the project area were used for the cumulative effects boundary.

These boundaries were chosen because this watershed size would provide the most comprehensive boundary when analyzing the cumulative effects to water quality from the proposed treatments. Also included in this analysis are the potential effects from Forest Service projects, Flower Lake and Quad County Tornado Salvage as well as past, present, and future timber sale projects located on State, County, and private managed forestland in Marinette and

Oconto Counties. These project boundaries overlap the Lakewood Southeast Project Area as well as the cumulative effects boundary. Sediment movement downstream can be variable and dependent upon the landform characteristics. The potential for short and long-term effects were addressed on a watershed basis analyzing effects to the seven sixth level HUC watersheds that lie within the Lakewood Southeast project area. Long-term effects are those expected to last longer than one year after treatment or design features are completed, while those expected to last less than one year were considered short-term. Short-term effects would be expected to occur during the first growing season or the time it takes exposed soil to become stabilized and re-vegetated. Long-term effects would be expected to occur in subsequent growing seasons, where the short-term effects were more prominent on the landscape and it would take longer for the sediment to flush downstream. Boundary distances and long verses short-term effects criteria were chosen to be consistent with Wisconsin's Forestry BMPs for Water Quality Monitoring program.

Action alternatives

Activities, such as, timber harvesting and road building, have occurred over the past 15-25 years and were implemented following forest plan standards and guidelines, site specific design features to mitigate aquatic resource impacts, or contract operating restrictions on CNNF lands. The CNNF has also implemented BMPs for Water Quality since 1995 and recent field monitoring indicates that 99.9 percent of the time there are no adverse impacts to water quality (Shy and Wagner 2007). As part of the 2006 WDNR BMP monitoring effort, three sales were located within the cumulative effects analysis area for the project. Monitoring results indicated that the District applied all BMPs correctly. Monitoring team comments indicated that the sale layout/activities implemented excellent stream protection; the District extended some areas the RMZ to the top of slopes. RMZ harvest activities also favored long-lived species and no equipment operation took place within 50 feet from the stream (Shy and Wagner 2007).

Many of the roads within the area have been in place since the early logging era. Over the years, the road mileage has increased and it is still based on roads located during the early logging era. It has contributed to changes in drainage patterns, increased sediment loads, fish passage problems, and loss of riparian habitat (forest plan FEIS, p. 3-19 through 3-25). Poorly designed, located, constructed, or maintained roads and trails can be significant sources of stream sediment. Considered the largest sources of sediment in streams because of failure, typically roads and trails with undersize culverts produce several tons of sediment and the entire volume is delivered to the stream.

Most failed culverts were originally installed many years ago without adequate design. When these sites fail, fill is often replaced over the same culvert to make the road or trail passable; however, the problem is perpetuated (forest plan FEIS, p. 3-19 through 3-25).

A summary of past activities that are located within the cumulative effects area for aquatic resources includes the list of projects below. Treatments proposed that are adjacent to riparian areas follow BMPs for water and wetland quality, as well as forest plan's standards and guidelines for wildlife, fish, soil, and water resources. Past FS activities located within the cumulative effects area for aquatic resources include:

- Quad County Tornado Salvage- 22 acres located within RMZs (implemented 2009)
- Lakewood-Laona Plantation Thinning- 20 acres of pine thinning located within RMZs

- Spruce Decline II- numerous stands located within RMZs but no harvest activity
- Travel Management Rule Project (ongoing Forest wide project)

Present FS activities located within the cumulative effects area for aquatic resources include:

- Hide and Seek Salvage- treatment areas located near unnamed tributaries to Waupee Creek (Harvest is completed)
- Flower Lake Project- 8.1 acres located within RMZs (ongoing to 2013)
- Lakewood-Laona Plantation Thinning II-17 acres of Pine thinning within RMZs
- Travel Management Rule Project- management of roads (ongoing Forest wide project)

Implement all project activities with site-specific design features to mitigate potential adverse effects to aquatic resources. If all design features, as identified in the project design features table for aquatic resources, are implemented and maintained during project activities, there would be no long-term impairment of water quality from these activities. A summary of reasonably foreseeable Forest Service activities that are located within the cumulative effects area for aquatic resources includes:

- Early successional habitat improvement project
- Ongoing road maintenance including selected culvert replacements or crossing improvements

Since analysis has indicated negligible risks to aquatic resources when project design features are properly implemented, cumulative impacts to water quality near the project area would be minimal. Past, present, and future harvest activities occurring on National Forest, other Federal, State, County, Tribal, private industrial, private nonindustrial, and miscellaneous corporate have been and would be occurring throughout the cumulative effects boundary. Based on WDNR Forestry BMPs for water quality monitoring results on all land ownerships in Wisconsin, effects to water quality would be negligible (Shy and Wagner 2007).

Consistency with the forest plan, Clean Water Act, and Forest Service Handbooks

All of the alternatives are consistent with the forest plan. Action alternatives would help the district move in the direction to meet forest plan goals and objectives. In the action alternatives, elimination of roads would help achieve objective 1.3d (forest plan, p. 1-3) to relocate, in this case eliminate, existing roads out of Riparian Management Zones to minimize erosion, sedimentation, and hydrologic impacts. The No Action Alternative would not help the district move in the direction to meet forest plan goals and objectives.

In addition, all of the alternatives are consistent with section 208 of the 1977 section Clean Water Act and section 319 of the 1987 Clean Water Act as well as the National Forest Service Policy Handbook Manuals, 2532- Water Quality Management, and 2522- Watershed Improvement (see section 3.12).

Conclusion of findings

Based on findings of minimal direct and indirect effects on water quality, this analysis concluded that the effect to water quality from proposed activities would not impair the long-term water quality.

The peak flow analysis indicates that adverse impacts to hydrology and water quality are very unlikely as a result of the proposed aspen clearcuts. The sixth level watershed, representing the worst-case scenario for highest concentration of aspen clearcuts and open area landscape condition, did not approach the thresholds for either snowmelt (less than 60 percent) or rainfall (less than 35 percent) runoff.

Timber harvest treatments proposed in action alternatives that are adjacent to riparian areas would follow BMPs, would not cause long-term impacts to water quality, and therefore would not exceed the threshold for water quality. Timber harvest activities proposed in Alternative 2 would promote the long-term health of riparian areas as there would be conversion to long lived species in these areas; as would the other action alternatives but on less acreage. All action alternatives would help the Lakewood-Laona Ranger District move in the direction to meet forest plan goals and objectives.

Decommissioning one mile of roads located within wetlands and decommissioning two stream crossings in all action alternatives would help to improve hydrologic functions by restoring cross drainage, reducing sediment inputs, and may help mitigate the potential effects from off-road vehicle use. The elimination of these roads would help the CNNF achieve Objective 1.3d to relocate, in this case eliminate, existing roads and trails out of Riparian Management Zones to minimize erosion, sedimentation, and hydrologic impacts.

3.10 Other Resources

3.10.1 Environmental Justice

The IDT encompasses a specific consideration of equity and fairness in resource decision-making in the issue of environmental justice. As in Executive Order 12898 (Federal action to address environmental justice in minority populations and low-income populations), provides that “each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations”.

Both minorities (one percent) and the poverty percentage (under four percent) are very low; therefore, no adverse effects to minorities or low-income populations are likely to occur. The No Action Alternative would have no effect on social systems. All groups of people use the road system. Changes in road management, under the action alternatives, including closing or decommissioning of any of the roads would have the same effect on all groups of people, including minorities and low income.

Alternative 1 would have no effect economically, whereas the Alternatives 2 and 3, to a lesser extent 4, may benefit low income and minorities by improving employment and income.

3.10.2 Management Area 8 E, F, and G

This section would discuss the effects of the project on MA 8E, 8F, and 8G. The IDT proposed no timber harvest activities in any of the MA 8s. They did propose prescribed fire for some

stands in the Waupee Lake Swamp. The IDT designed adjacent activities to be complimentary to MA 8 objectives.

The Waupee Lake Swamp occurs on the Butler Plains, which is dry, sandy, and historically prone to wildfires. Guyette and Stambaugh conducted a fire study in 2010 in the Airport Road area and included data from the Waupee Lake Swamp complex. This study identified seven major fires from 1664 to 1820 and numerous other smaller fires up to 1948 (Guyette et al 2010). This data clearly shows that fire is part of the natural disturbance regime in the area and that prescribed fire would be an appropriate management tool to help maintain the character of the Waupee Lake Swamp natural area.

Analysis of the adjacent proposed activities to the MA 8 areas found that these activities are complimentary to MA objectives. Listed below are the MA 8s in the project area: Croswell Uplands (MA8G), Hagar Mountain (MA 8F and G), Nelligan Lake Swamp (MA 8F), Section 34 Swamp (MA 8F), Sunrise Lake Pines (MA 8F), Tar Dam Pines (MA 8F), and Waupee Lake Swamp (MA 8 E, F, and G), Bagley Rapids (MA8 F and G), Hay Creek Swamp (MA 8G), and Priest Rock (MA 8F).

3.10.3 Recreation/Visuals

The project area does not contain any wild and scenic rivers, wilderness, wilderness study areas, or national recreation areas. The project area recreational use is fishing, hunting, camping, berry picking, motorized, and non-motorized uses. The IDT has reviewed visual quality of the area and implemented protection required from the forest plan (p. 2-29 through 2-31, HH-1and HH-6); see chapter 2, section 2.3.1 for design features.

3.10.4 Climate Change

The Forest Service is not required to address the effects of individual projects on climate change. The February 2010 memo from the Council on Environmental Quality (CEQ) specifically excluded land management agencies because "land management techniques, including changes in land use or management strategies, lack any established Federal protocol for assessing their effect on atmospheric carbon release and sequestration at a landscape scale."

Forest Service analysis of this issue (Climate Change Considerations in Project-level Analyses, 2009) concludes that, "It is not currently feasible to quantify the indirect effects of individual or multiple projects on global climate change and therefore determining the significant effects of those projects or project alternatives cannot be made at any scale."

Carbon budget of the Forest

The CNNF is working in close partnership with the scientific community on this topic. The first version of a mitigation assessment has been completed by Forest staff and scientists from the Forest Service's Northern Research Station and the University of Wisconsin-Madison (Birdsey et al 2010). Existing carbon stocks were calculated for the analysis area. Further work (version two) is underway to consider the effects of different management scenarios on carbon. This work would help us better quantify the mitigation gains and/or losses of a variety of management actions.

Why a landscape scale, not project scale, is most appropriate for carbon analysis
Mitigation is best addressed at a much larger scale than the project level for two reasons. The first reason is that project level effects (positive or negative) on the global concentration of carbon dioxide or other greenhouse gases are very difficult to measure. The second reason is the boundaries of analysis of mitigation measures extend well beyond the CNNF. For example, substitution of wood products for fossil-fuel-intensive materials and replacement of woody bio-fuels for fossil fuels can have significant mitigating effects.

The Intergovernmental Panel on Climate Change (IPCC) concluded "Landscape-level carbon stock changes are the sum of stand level changes, and the impacts of forest management on carbon stocks ultimately need to be evaluated at landscape level."

At the landscape scale, the amount of carbon stored in the forest remains essentially the same, even though every year a portion is harvested. The stability of carbon stocks is attributable to growth of trees across the landscape, which offsets the small portion of trees harvested in any given year.

Importance of looking at longer time scales
It is important to consider a larger spatial scale, as well as a longer temporal scale. While it is true that for a short period of time, leaving a forest intact appears to sequester more carbon than harvesting and regenerating. Over a longer time period, repeated harvesting and regeneration can provide more total carbon storage in the ecosystem and wood products if substitution of wood for other materials is part of the accounting system (Birdsey et al 2010).

Current science indicates that harvesting results in carbon emissions. Those emissions are not the sole factor in evaluating the effects of harvest on overall carbon levels and global climate change. Substituting sustainably produced, renewable wood products for fossil fuel based products in areas such as heating, electricity production, transportation fuels, construction materials, and packaging can reduce carbon emissions. If harvested wood is used for durable wood products, there is an added level of carbon storage.

Following harvest, durable wood products lock up the original carbon for varied amounts of time depending on the product. New vegetation growth begins to recapture the "lost" stored carbon. To know whether timber harvest would result in an overall increase or decrease in global carbon emissions it is necessary to know the full life cycle of the wood that is removed.

Gower and Ahl conducted a life-cycle assessment of the CNNF's biological and industrial carbon cycle. They used this information to model three different forest harvest scenarios: no harvest, normal harvest, and double harvest. Moderate (current level) harvesting had a net positive effect on sequestration because young regenerating stands are able to sequester large amounts of carbon. No harvesting (steady state forest) has a net sequestration close to zero. Findings of the IPCC in its Fourth Assessment Report concluded that " In the long-term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks,

while producing an annual sustained yield of timber, fiber or energy from the forest, would generate the largest sustained mitigation benefit" (IPCC 2007a).

CNNF is a carbon sink

The CNNF has a good understanding of the Forest's biological and industrial carbon budget based on recent and locally based research. Perhaps the most relevant research regarding the effects of forest management on greenhouse gas emissions on the CNNF is the carbon life-cycle analysis research conducted by Dr. Tom Gower and his associates at UW-Madison. Gower and Ahl calculated the industrial carbon cycle, including all the emissions associated with timber harvest, transportation, and processing. They concluded that even with current harvest levels, the CNNF is acting as an overall carbon sink. This means that more carbon (or carbon dioxide) is stored than is emitted on the CNNF.

Many studies show a net reduction in greenhouse gas emissions results from substituting timber products for other materials (for example, cement, steel, and heating fuel that consume more fossil fuels to produce than wood substitutes). When substitution effects are anticipated, the proposed actions could actually result in a small offset of other global carbon emissions.

In short, the proposed vegetation management actions are not expected to result in an overall net increase in greenhouse gas emissions and the CNNF would continue as an overall carbon sink.

Relatively quick recovery from source to sink following harvest

There is little evidence that, in general, Lake States forest ecosystems become net carbon emitters for more than 5-10 years after harvest (e.g., Smith et al 2006 Table C1), though exceptions may exist depending on local factors.

Euskirchen et al. (2002), using an eddy-covariance tower, reported a young jack pine stand on the CNNF transitioned from carbon source to a carbon sink between 10 and 20 years following disturbance.

Peckham and Gower (2011) calculated net primary productivity (NPP) and net ecosystem productivity (NEP) on the CNNF using the BIOME-BGC model. They found that NPP is initially low for several years after disturbance, reaches a maximum at canopy closure (10-30 years), and then declines as the stand matures (Gower et a. 1996; Ryan et al 1997). NEP is typically negative for several years after a stand-replacing disturbance, reaches a peak around canopy closure, and then declines to near zero for many forests (Bond-Lamberty et al 2004). For sugar maple, BIOME-BGC simulated the negative NEP immediately after harvest, peak NEP around canopy closure, and a 74 percent decline at maturity. Desai et al. *(*2008) reported that NEP decreased by 71 percent between the 75-year-old (on the CNNF) and the 200-year-old growth northern hardwood forest (on the nearby Ottawa NF).

Since NEP changes with time as forests age, a landscape that is composed of stands with different ages can offset losses from one stand with carbon gains from another. The net result of these stand level changes determines overall landscape level carbon stores (Birdsey et al 2010).

In 2009, a partnership between the Forest, the Northern Research Station, and Northern Institute for Applied Carbon Science resulted in two assessments. The first assessment focuses on the vulnerabilities of ecosystems in northern Wisconsin to climate change (Swanston et al 2011). Version 1 was published as a general technical report in 2011. An initial mitigation assessment is in draft form with additional modeling and analysis underway. Building upon these assessments, the Forest Adaptation Resources (FAR): climate change tools and approaches for land managers' document was developed (Swanston et al. in press).

The CNNF working in the Climate Change Response Framework (CCRF) and represents an opportunity to integrate climate change science with on-the-ground management. The products of this collaborative effort would be of great benefit to the CNNF as we strive to better adapt forests to climate change. We do want to clarify, however, that the two assessment documents and the FAR document are intended to provide information and tools, but not direction. It is our hope that they would supplement existing analytical and decision processes, not replace them.

Current Forest Plan contains many adaptation strategies

The CCRF does provide an explicit process for considering climate change, but many of the adaptation approaches listed in the FAR document are already incorporated into the forest plan, and many of these are also identified as objectives in the projects purpose and need.

Table 3.10.4: Correlation between the FAR document, the forest plan, and the purpose and need

Adaptation Approach from FAR document	**Forest Plan Direction**	**Lakewood Southeast Project Purpose and Need**
Prioritize and protect sensitive or at-risk species or communities	Objective 1.4b, p. 1-3	Restore Pine Barrens and/or emulate natural disturbance regimes
Maintain and restore diversity of native tree species	Guideline p2-25	Increase species diversity (Guideline, p 2-25)
Restore fire to fire adapted ecosystems	Objective 1.4c, p. 1-3).	Restore components and process in the dry northern forest ecosystem
Maintain or restore riparian areas	Guideline, p. 2-17	Improve trout stream buffers
Establish fuel breaks to slow the spread of catastrophic fire	Guideline, p. 2-25	Reduce hazardous fuels in the urban interface
Prioritize and protect existing populations on unique sites.	The forest plan (Objective 1.4j, p. 1-4) encourages the planting of white pine and hemlock where opportunities are present.	Improve the nesting habitat for red-shouldered hawks and goshawks within the project area.
Maintain or improve the ability of forests to resist pests and pathogens	Guidelines, p. 2-8, 2-10, FF1 through FF-3	Control forest stand density to improve growth and vigor or modify stand composition to meet other objectives

Adaptation Approach from FAR document	Forest Plan Direction	Lakewood Southeast Project Purpose and Need
Promote diverse age classes	Guidelines, p. 2-5, 2-9, 2-10, 2-12).	Manage species age class distribution for aspen, oak, red pine, and white pine

Adaptation ideas are embedded in many of the project design features. Examples include the protection of RFSS, non-native invasive plant species control, and restoration of native plant communities.

Finally, while management is not required for forests to be resilient, careful management can increase resilience (Perschel et al 2007; Millar et al 2007). Maintaining species diversity spreads the risk of changes due to climate change and can reduce susceptibility to some insects and diseases (Perschel et al 2007; Millar et al 2007). Treatments that improve individual tree health and vigor, such as thinning and singletree selection, can increase resistance to insects and disease (Perschel et al 2007).

The CNNF is actively engaging in demonstration projects to learn how best to incorporate CCRF materials into CNNF actions

The climate change adaptation tools and information described above (EVAS, WICCI Assessment, and FAR document) have only just been completed in the last year; the FAR document is not published.

To see how best to integrate climate change adaptation into broad decision-making processes, the CNNF is actively testing the application of the FAR Adaptation workbook. Efforts would be made, through a series of demonstration and implementation activities on the CNNF and elsewhere in northern Wisconsin, to integrate climate change into on-the-ground management and gain experience. We currently have four "demonstration projects" underway on the CNNF each representing different places, different scales, and different steps in the decision-making process. For example, to learn how to incorporate adaptation ideas into a large vegetation management project, we would use the Black Torch Vegetation Management Project as a demonstration project. This work is in the very early stages.

Other demonstration projects are focused on smaller scales and different points in the implementation process. For example, on the Park Fall-Medford District a team identified adaptation practices that could be incorporated into the silvicultural prescription for two stands, just prior to marking.

Full-scale integration of these tools into forest management practices and planning would not happen overnight. CNNF would consistently build upon the lessons learned from each demonstration project.

3.11 Short-Term Uses and Long-Term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by Congress, this includes using all practical means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA section 102).

The proposed action is short-term use (removal of timber) that may have effects to different resources and uses. As these short-term trade-offs change from year to year, or are rectified, the long-term productivity and sustainability for timberland resources in the project area would be moving toward and meeting the desired conditions described in the forest plan. This condition would provide the public with a diverse ecological setting meeting the multiple use demand.

3.12 General Cumulative Effects

Consideration of reasonably foreseeable actions
In considering, cumulative impacts of the project actions (EIS chapter 3 discussions); reasonably foreseeable actions were considered in two ways. The first was about whether the proposed and alternative actions were consistent with the forest plan. The second was by using detailed, site-specific assessments of reasonably foreseeable actions where meaningful information was available to conduct such assessments.

1. *Consistency with the forest plan*: Cumulative impacts of implementing the forest plan were programmatically considered in the forest plan DEIS. Such effects, though not site-specific, considered the magnitude and context of allowable and anticipated actions occurring 10-15 decades into the future. Each proposed and alternative action, with other proposals, developed or undeveloped, were evaluated for how they fit into the program of actions found in the forest plan. The table below discloses the specific proposals considered. This evaluation tiers to the forest plan cumulative effects considerations of reasonably foreseeable actions.
2. *Site-specific assessments*: In order to assure a "hard look" at impacts as required under an EIS, project site-specifically considered reasonably foreseeable actions by applying existing CEQ cumulative effects guidance using a detailed process as described in the "Assessing Cumulative Impacts on the CNNF." In determining those actions meaningful to consider for the detailed site-specific assessment, we used agency direction at 36 CFR 220.3 defining "Reasonably foreseeable future actions" and 36 CFR 220.4(a) (1) defining "identified proposals." If the IDT has not developed a future proposal to a stage where effects could be "meaningfully evaluated," it was not included in the detailed assessment. Such approach has been affirmed by case law at HEC vs USFS (01/2009) and HEC vs USFS (03/2009). The IDT considered speculative undeveloped future actions regarding detail of information, but are considered programmatically under 1), above.

The following table shows the projects used for analysis of this project. Different resource specialists may use different projects in their analysis depending on which ones affect their resource.

Table 3.12.1: CNNF vegetation management projects (past, present, and reasonably foreseeable 2013)

Project name	**District**
Argonne Cutting Methods Study	Eagle River-Florence
Fishel	Eagle River-Florence
Grubhoe	Eagle River-Florence
Longrail	Eagle River-Florence
NW Howell	Eagle River-Florence
Phelps	Eagle River-Florence
Polecat Pine	Eagle River-Florence
Tucker Salvage	Eagle River-Florence
Cayuga	Great Divide
Great Divide Red Pine Thin	Great Divide
Twentymile	Great Divide
Twin Ghost	Great Divide
Black Torch	Great Divide
Big Swamp Resource Mgt.	Lakewood-Laona
Boulder	Lakewood-Laona
Flower Lake	Lakewood-Laona
Heterobasidion Root Disease	Lakewood-Laona
Hide and Seek Salvage	Lakewood-Laona
Honey Creek-Padus	Lakewood-Laona
Killdeer Resource Mgt. Project	Lakewood-Laona
Lakewood-Laona Biomass Study	Lakewood-Laona
Lakewood-Laona Vista Maintenance	Lakewood-Laona
Lakewood Southeast	Lakewood-Laona
McCaslin	Lakewood-Laona
Plantation I	Lakewood-Laona
Plantation II	Lakewood-Laona
Quad-County Tornado Salvage	Lakewood-Laona
2009 Medford Spruce Thin	Medford-Park Falls
Camp Four	Medford-Park Falls
Hoffman Sailor West	Medford-Park Falls
Medford Aspen	Medford-Park Falls
Park Falls Hardwood	Medford-Park Falls
Riley Wildlife Management Area	Washburn
Fishbone	Washburn
Kirtland's Warbler Habitat	Washburn
NW Sands	Washburn
Sunken Moose	Washburn
Washburn Red Pine Thinning	Washburn
Early Successional Habitat Improvement	Multiple districts
MVUM	Multiple districts
Plantation I	Multiple districts
Plantation II	Multiple districts
Spruce Decline	Multiple districts
Spruce Decline II	Multiple districts

3.13 Other Required Disclosures

NEPA at 40 Code of Federal Regulations (CFR) 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

Lakewood Southeast Project consistency with the forest plan
Implementation of the action alternatives would be consistent with resource direction for standards in the forest plan. All the action alternatives move toward the forest plan's desired conditions. Alternatives 2 and 3 vary in how they close they get to the DFC's and which is best by the different actions (one may closer in Need 3 but further in Need 4, etc.). Alternative 4 moves toward the forest plan direction the least (see the tables at the end of chapter 2). The No Action Alternative would not be consistent with several of the forest plan standards due to species age and composition, plus other objectives. The forest plan standards and guidelines, design features, and monitoring described above are included in the decision for this analysis and carried forward into development of the commercial timber sale.

Consistency with Direction for RFSS, plants of local concern and with other R9 Sensitive Plant Species
The analysis did not identify inconsistencies with any of the above directions when including design features.

Consistency with other laws and regulations
Chapter 30 (Wisconsin State Statute), Trans 207 (Wisconsin Administrative Code), and Storm Discharge Permits
The US government delegated portions of the Clean Water Act to the states for implementation. Federal agencies are required to obtain State permits when they relate to water quality protection. In Wisconsin, chapter 30 and Trans 207 permits are required for the construction of a ford or installation of a culvert or bridge across a State navigable (perennial or intermittent) stream. These permits also include provisions to protect water quality from sedimentation or other types of non-point sources of water pollution. The District would obtain a section 30 or Trans 207 permit for replacement of culverts before implementing any in stream work. This may also include Clean Water Act NPDES permit for storm water discharge.

Clean Air Act
This act includes the Environmental Protection Agency in accordance with the National Environmental Policy Act 42 United States Code 4231, Council on Environmental Quality (CEQ) regulations 40 CFR, Parts 1500-1508, and section 309 of the Clean Air Act.

The Endangered Species Act of 1973
This act shows Forest Service direction about how to address federally listed proposed, candidate, threatened, or endangered – Forest Service Manual (FSM 2670.3). The biological evaluation is a processes used for sensitive species evaluation (FSM 2672.43).

US Fish and Wildlife Service reviews the project in accordance with the Endangered Species Act (Public Law 93-205) and (FSM 2671.45), implementing regulations for projects with threatened or endangered species.

Executive Order 11988
This Executive order concerning floodplain management, directs agencies to avoid to the extent possible the short and long-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. The proposed actions do not pose the risk of flood loss, impacting human safety, health and welfare, and impacts to the natural and beneficial values served by floodplains.

Executive Order 11990
This Executive order concerning protection of wetlands, directs agencies to avoid to the extent possible the short and long-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. Known major wetland areas (as defined in section 6, (c)), have been protected or managed specifically for the protection of wetland resources in past management strategies and in the action alternatives.

Executive Order 12898
Environmental Justice directs agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The proposed actions do not affect any of the populations mentioned above.

National Historic Preservation Act
This project is consistent with Wisconsin State Historical Preservation Office. It is in accordance with the National Historic Preservation Act (Executive Order 11593) for ground disturbing actions in historical places.

The National Forest Management Act (NFMA) of 1976
Design features shall be specified in the project NEPA; as well as standards and guidelines, and management directives set forth in the forest plan. This project follows direction in FS policy for habitat maintenance for all existing native and desired non-native plants, fish, and wildlife species (FSM 2601.2).

*Section 319 and 404 of the Clean Water Act, as amended in 1977 (33 Untied States Code 1344***)**
The Federal Water Pollution Control Act of 1972, as amended, is commonly referred to as the Clean Water Act. This was enacted to restore and maintain the chemical, physical, and biological integrity of the Nations waters. Section 319 for the 1977 amendments requires each State to develop and implement a program to control silviculture-related and other non-point sources of water pollution to the maximum extent practicable. Non-point sources of water pollution are controlled by the use of “best management practices.” Wisconsin developed Forestry BMPs for Water Quality in 2010 (WDNR 2010). These practices are used as design features to prevent non-point sources of water pollution from forest management activities.

Under section 404, the US Army Corps of Engineers has been given responsibility to regulate the discharge of dredged and fill material into waters of the United States, including wetlands (33 CFR 323.3). Normal silvicultural activities, including harvesting for the production of forest products or upland soil and water conservation practices, may require section 404 permits (33 CFR 323.4). Construction and maintenance of forest roads for normal silviculture may also require permits, even when best management practices are applied (33 CFR 323.4; WDNR 2010). Where a section 404 permit is required, a section 401 water quality certification from the State of Wisconsin may be required (33 CFR 325.2; NR 103 Water Quality Standards for Wetlands). Appropriate Federal and State permits are obtained prior to implementation of projects involving wetlands.

All appropriate permits needed from the Army Corps of Engineers and Wisconsin Department of Natural Resources would be obtained prior to construction activities when needed. This may include Clean Water Act NPDES permit for storm water discharge. All alternatives are consistent with the Clean Water Act, meet water quality criteria, and maintain beneficial uses of waters in and downstream of the project area.

4.0 Consultation and Coordination

4.0.1 Preparers

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Joyce McKay, Archaeologist
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Mike Miller, Civil Engineering Technician
Sara Sommers, Hydrology
Scott Anderson, Wildlife Biologist
Scott Linn, Assistant Fire Management Officer
Jay Saunders, Zone Fire Management Officer
Steve Janke, Ecologist

4.0.2 Agencies and Tribes Consulted

Great Lakes Indian Fish and Wildlife Commission
Lac Coute Oreilles Tribal Government
Mille Lacs Chippewa Tribe
Lac Viex Desert Band of Lake Superior Chippewa Indians
Menominee Indian Tribe of Wisconsin
Lac du Flambeau Chippewa Tribe
Red Cliff Chippewa Tribe
Oneida Tribe of Indians of Wisconsin
Oconto County

St. Croix Chippewa Indians of Wisconsin
Sokaogan Chippewa Community
Keweenaw Bay Indian Community
Forest County Potawatomi
Wisconsin Department of Natural Resources
US Fish and Wildlife Service
Wisconsin State Historical Protection Office

4.3 List of Agencies, organizations, or persons to whom Copies of this statement are sent (or website location).

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5.0 Literature cited

General

Benzie, J.W., 1977. Manager's handbook for jack pine in the North Central States. USDA For. Serv., Gen. Tech. Rep. NC-32, p. 18. North Central Forest Experiment Station, St. Paul, MN.

Eckstein R, Moss B. 1995. Oak and Pine Barrens communities. In: Addis J (ed) Wisconsin's biodiversity as a management issue: a report to WDNR managers, p. 98-113. WDNR, Madison.

Guyette, R.; Stambaugh, M.; Marschall, J.; Dey, D. A summary of fire history along the Airport Road, Chequamegon-Nicolet National Forest, northeast Wisconsin. 2010. p. 5.

Perala, D.A. and A.A. Alm. 1989. Regenerating Paper Birch in the Lake States with the Shelterwood Method. Northern Journal of Applied Forestry 6(1989), p. 151-153.

Perala, D.A. 1990. Silvics of North America Volume 2- Hardwoods. Quaking Aspen. USDA Forest Service. Agriculture Handbook 654.

Pohlman, John D., Gerald A. Bartelt, Andrew C. Hanson III, Paul H. Scott, and Craig D. Thompson (Editors). 2006. Wisconsin Land Legacy Report: An inventory of places to meet Wisconsin's future conservation and recreation needs. Wisconsin Department of Natural Resources, Madison, WI.

USDA Forest Service, Annual, Motorized Visitor Use Map, Published by MJVC, Arnold, MO.

USDA Forest Service, 2005, Assessing Cumulative Impacts on the CNNF. Unpublished.

USDA Forest Service. Quarterly. Schedule of Proposed Actions. CNNF.

USDA Forest Service. February 1990. Killdeer Resource Management Project. USFS. Unpublished.

USDA Forest Service. July 1993. Big Swamp Resource Management Project. USFS. Unpublished.

USDA Forest Service. 2001. Southeast Pine Project Area. USFS. Unpublished.

USDA Forest Service. April 2004. Final Environmental Impact Statement for the Chequamegon Nicolet National Forest Land and Resource Management Plan, US Printing Office, Washington D.C.

USDA Forest Service. April 2004. Chequamegon Nicolet National Forest Land and Resource Management Plan, US Printing Office, Washington D.C.

USDA-FS. 2005. Chequamegon-Nicolet National Forest Non-Native Invasive Plant Control Project Environmental Assessment. Park Falls, WI

USDA Forest Service. 2008. Transportation Analysis Report for the Lakewood Southeast Project. Unpublished.

USDA Forest Service. 2008. Lakewood-Laona Plantation II Thinning. Lakewood, WI. Unpublished.

USDA Forest Service. 2012. Early Successional Habitat. CNNF. Unpublished.

US Government. 1970. Clean Air Act. Government Printing Office, Washington D.C.

US Government. 1977. Clean Water Act (Federal Water Pollution Control Act of 1977). 33 U.S.C. 1251 et. Seq. Government Printing Office, Washington D.C.

US Government. 1973. Endangered Species Act. Government Printing Office, Washington D.C.

US Government. 1971. Executive Order 11593-National Historic Preservation Act. Executive Office of the President of the United States. US Government Printing Office. Washington D.C.

US Government. 1977. Executive Order 11990-Protection of Wetlands. Executive Office of the President of the United States. US Government Printing Office. Washington D.C.

US Government. 1977. Executive Order 11988-Flood Plain Management. Office of the President of the United States. US Government Printing Office. Washington D.C.

US Government. 1994. Executive Order 12898. Environmental Justice. Executive Office of the President of the United States. Washington D.C.

US Government. 2005. Forest Service Manual 2670. US Government Printing Office. Washington D. C.

US Government. 1969. National Environmental Policy Act, as amended. Government Printing Office. Washington D.C.

US Government. 2011. 40 CFR 1502.16. NEPA, Environmental Consequences. Government Printing Office, Washington D.C.

US Government. 1976. National Forest Management Act, as amended. Government Printing Office. Washington D.C.

US Government. 2009. HEC vs. USFS. Court cases of 1-2009 and 3-2009. Unpublished.
US Government. 2011. Discharge Permits. 33 CFR 323. Government Printing Office, Washington D.C.
US Government. 2011. Processing applications. 33 CFR 325. Government Printing Office, Washington D.C.
WDNR. 2005. Wisconsin's Strategy for Wildlife Species of Greatest Conservation Need. WDNR. Madison, WI
WDNR. 2006. The Northeast Sands Wisconsin Land Legacy Report: http://dnr.wi.gov/landscapes/index.asp?mode=detail&Landscape=15
WDNR. 2007. Wisconsin Natural Heritage Working List. Retrieved 4/21/2009. http://dnr.wi.gov/org/land/er/wlist/index.asp?mode=detail&Taxa=C
WDNR. 2010. Best Management Practices for Water Quality-Field Manual. WDNR. Madison, WI.

BE

BCI. 2001. Bats in Eastern Woodlands. Austin, TX, USA: Bat Conservation International, Inc.
Bosakowski, T. 1999. The Northern Goshawk: Ecology, Behavior and management in North America. Blaine WA: Hancock House publ.
Carmean, W.H., J.T. Hahn, R.D. Jacobs. 1989. Site index curves for forest tree species in the eastern United States. St. Paul, MN: USDA Forest Service North Central Forest Experiment Station - GTR-NC-128, St. Paul, MN.
Eklund, D. 2009. Marten Release Movements. (S. Anderson, Interviewer)
Eklund, D. 2005. Personal Communications with Robert Evans.
Ennis, K. R., J. Blum, J. Kelly, C. Schumacher, E. Padley, and T. Schuetz. (1993). Management Recommendations for the northern goshawk on the Huron-Manistee National Forests. Huron-Manistee National Forest. Cadillac, MI: US Forest Service.
Gore, J.A. and W.A. Patterson III. 1986. Mass of downed wood in northern hardwood forests in New Hampshire: potential effects of forest management. Canadian Journal of Forestry Research, 16: 335-339.
Jacobs, J. and E. A. Jacobs. 2002. Conservation Assessment for red-shouldered hawk (Buteo lineatus) on National Forests of North Central states, p. 100. Milwaukee, WI: USDA Forest Service; Eastern Region, Milwaukee, WI.
Schenck, T., C. Chaney, T. Doyle, M. Shedd, M. St. Pierre & S. Hess-Samuelson. 2004. Expert panels for species viability evaluation for preliminary draft EIS alternatives National Forests in Wisconsin and Minnesota. In P. u.-N. Forest (Ed.) p. 19. Unpublished paper 1/8/2004.
St. Pierre, M., et al. 2008. Unpublished report.
St. Pierre, M. 2010. Process Paper: Habitat Models for Effects Analysis; Animals RFSS. Wildlife. Rhinelander, WI: USDA Forest Service Chequamegon-Nicolet National Forest.
USDA Forest Service. 2004. Chequamegon-Nicolet National Forests Final Environmental Impact Statement Appendices A-P to accompany the 2004 Land and Resource Management Plan. Rhinelander, WI.: R9-CN-FEIS-Appendices-0404.
USDI Fish and Wildlife Service. 1978 and 1992. Recovery Plan for the Eastern Timber Wolf, p.73. Twin Cities, MN: USFWS.
USDI Fish and Wildlife Service. 2007. Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision. Minnesota: Fort Snelling.

WDNR. 1999. Wisconsin Wolf Management Plan. Madison, WI: Wisconsin Endangered Resources Publ. #099 99.

WDNR. 2013. Gray wolf in Wisconsin. Retrieved February 2013, from Wisconsin Department of Natural Resources: http://dnr.wi.gov/topic/WildlifeHabitat/wolf/index.html

Williams, B. W. and K. T. Scribner. 2006. Spatial genetic structure of Wisconsin martens: potential directions and ideas. Unpublished report.

Woodford, J. 2005. Proposed Wisconsin Department of Natural Resources Management Guidance for Northern Goshawks. Rhinelander, WI: WDNR Bureau of Endangered Resources.

Woodford, J. 2008. Working Management Guidelines for Northern Goshawks Nesting Areas. Rhinelander, WI: Wisconsin Department of Natural Resources - Bureau of Endangered Resources.

Woodford, J., B. Kohn, K. Russell, C. Thomas, T. White and A. Wydeven. 2005. Summary Report: Inventory, Status, and Management Needs of American Marten in Wisconsin. Madison, WI: WDNR - Bureau of Endangered Resources: Ecological Inventory and Monitoring Section.

Woodford, J., C. A. Eloranta and A. Rinaldi. 2008. Nest density, productivity, and habitat selection of red-shouldered hawks in contiguous forest. Journal of Raptor Resource, 42(2), 79-86.

Wydeven A. P., J. E. Wiedenhoeft, R. N. Schultz, J. E. Bruner, R. R. Thiel, S. R. Boles, and M. A. Windsor. 2011. Wisconsin Endangered Resources Report #140 Status of the Timber Wolf in Wisconsin. Performance Report 1 July 2010 through 30 June 2011. Park Falls, WI: WDNR.

Zoller, P. 2004. Documentation for Landscape Level Marten HIS Model (unpublished). Rhinelander, WI: North Central Research Center.

Climate Change

Birdsey, R. A.; Pan, Y; Steward, S.; Hines, S.J.; Janowiak M.K.; Parker, L.R.; Swanston, C.W.; Mladenoff, D.J.; Lichstein, J.; Wayson, C.; McCullough, K. 2010. Preliminary Mitigation Assessment: A report from the Climate Change Response Framework Project in Northern Wisconsin, Version 1, p 45. USDA Forest Service, Northern Research Station. Unpublished paper.

Bond-Lamberty B, Wang C & Gower ST. 2004. Net primary production and net ecosystem production of a boreal black spruce fire chronosequence. Global Change Biol. 10(4): 473-487.

Council on Environmental Quality. 2010. Memorandum for heads of federal departments and agencies regarding draft NEPA guidance on consideration of the effects of climate change and greenhouse gas emissions. Signed by Nancy H. Sutley, CEQ Chair, February 18, 2010.

Desai, A. R, A. Noormets, P.V. Bolstad, J.Q. Chen, B.D. Cook, K.J Davis, E.S. Euskirchen, C.M. Gough, J.G. Martin, D.M Ricciuto, H.P. Schmid, J.W. Tang, and W.G. Wang. 2008. Influence of vegetation and seasonal forcing on carbon dioxide fluxes across the Upper Midwest, USA Implications for regional scaling. Agricultural and Forest Meteorology 148, 288-308.

Euskirchen, E.S., J.Q. Chen, H.B. Li, E.J. Gustafson, and T.R. Crow. 2002. Modeling landscape net ecosystem productivity (LandNEP) under alternative management regimes, Ecological Modeling 154 (1- 2), 75-91.

Gower, S.T. and D.E. Ahl. 2006. Carbon and Greenhouse Gas Budgets for Wisconsin Forests and Forest. Wisconsin Focus on Energy Research Grants. Unpublished, p. 102.

Intergovernmental Panel on Climate Change (IPCC). 2007. Climate change 2007: mitigation of climate change, Metz, B., O.R. Davidson, P.R. Bosch, R. Dave, and L.A. Meyer (eds.). Contribution of Working Group III to the Fourth Assessment Report of the IPCC, Cambridge University Press, Cambridge, UK, and New York. Available online at www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg3_report_mitigation_of_climate_change.htm; last accessed January 24, 2012.

Millar, C.I., N.L. Stephenson, and S.L. Stephens. 2007. Climate Change and Forests of the Future: Managing in the Face of Uncertainty. Ecological Applications, 17(8):2145–2151.

Peckham S. D. and S.T Gower. 2011. Simulated long-term effects of harvest and biomass residue removal on soil carbon and nitrogen content and productivity for two Upper Great Lakes forest ecosystems. Global Change Biol. 3, (2): 235-147.

Preschel, R.T., A.M. Evans, and M.J. Summers. 2007. Climate Change, Carbon, and Forests of the Northeast. Forest Guild. Santa Fe, NM. www.forestguild.org/publications/2007/ForestGuild_climate_carbon_forests.pdf

Ryan M.G., D. Binkley, and J.H. Fownes. 1997. Age-related decline in forest productivity: pattern and process. Advances in Ecological Research 27: 213-262.

Smith, J.E.; Heath, L.S.; Skog, K.E.; and Birdsey, R.A. 2006. Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States. Gen. Tech. Rpt. NE-343, p. 216. USDA Forest Service Northeastern Research Station. Newtown Square, PA.

Swanston, C.; M. Janowiak; L. Iverson; L. Parker; D. Mladenoff; L. Brandt; M. St. Pierre, Matt; A. Prasad; S. Matthews; M. Peters; D. Higgins; A. Dorland. 2011. Ecosystem vulnerability assessment and synthesis: a report from the Climate Change Response Framework Project in northern Wisconsin. Gen. Tech. Rep. NRS-82, p. 142. Newtown Square, PA: US Forest Service, Northern Research Station.

Swanston, C.W. and M.K. Janowiak (editors). In press. Forest Adaptation Resources: Climate change tools and approaches for land managers. Gen. Tech. Rep. NRS-87, p. 108. Newtown Square, PA: US Forest Service, Northern Research Station.

USDA Forest Service. 2009. Climate change considerations in project level NEPA analysis. Internal agency document.

Fire

Fites, J., & Campbell, M., & Reiner, A., & Decker, T. 2007. Fire Behavior and Effects Relating to Suppression, Fuel Treatments and Protected Areas on the Antelope Complex and Wheeler Fire, p. 18. The fire behavior assessment team.

Murphy, K., & Rich, T., & Sexton T. 2007. An Assessment of the Fuel Treatment Effects on Fire Behavior, Suppression Effectiveness and Structure Ignition on the Angora Fire, USDA R5-TP-025, p.14.

National Wildfire Coordinating Group. 1993. NWCG fireline handbook: appendix B: fire behavior. NFES 2165, p. B58-59. National Interagency Fire Center. Boise.
Ottmar, Roger D.; Vihnanek, Robert E.; Wright, Clinton S. 2002. Photo Series for Quantifying Natural fuels. Volume Va: jack pine in the lakes states. PMS 837. Boise ID: National Wildfire Coordination Group, National Interagency Fire Center.
US Government. 2003. Healthy Forests Restoration Act. Government Printing Office. Washington D.C.

MIS and MIH

Alverson etal. 1989. Forests Too Deer: Edge Effects in Northern Wisconsin. Conservation Biology, Volume 2, No. 4. Madison, WI
Cote etal. 2004. Ecological Impacts of Deer Overabundance. Annual Review of Ecology, Evolution, and Systematics, Volume 35. Annu. Rev. Ecol. Syst.
Currnutt, J. 2009. Conservation Assessment for Northern Goshawk (Accipitor gentilis) in the Western Great Lakes Region. Milwaukee, WI: USDA Forest Service.
Erdman, T. 2003. Letter to CNNF Re; Nest Buffers.
Erdman, T. 2006. Northern Goshawk Nesting Survey 2006 - Nicolet National Forest. Report submitted to Chequamegon-Nicolet National Forest - Unpublished Data.
Erdman, T. C., D. F. Brinker, J. P. Jacobs, J. Wilde, and T. O. Meyer. 1998. Productivity, population trend, and status of Northern Goshawks, (Accipiter gentiles atricapillus), in Northeastern Wisconsin. Canadian Field-Naturalist, 112 (1): 17-27 pp.
Foster, D. 1993. Taxus canadensis Marsh. Its range, ecology, and prospects in the state of Wisconsin. Madison, WI: UW-Madison.
Jacques. 2012. Winter Severity Indices 2010-2011.
McCaffery. 2000. Deer Baiting and Feeding Issue. Meeting at Hillman, MI.
McGuinness, Barbara and David deCalesta. 1996. White-tailed Deer Alter Diversity of Songbirds and Their Habitat in Northwestern Pennsylvania. Pennsylvania Birds. Vol 10 No. 2, p. 56.
Miller etal 2009. White-tailed deer herbivory and timber harvesting rates: Implications for regeneration success. Forest Ecology and Management 258. Elsevier.
Quinn, B., D. Eklund, M. St Pierre and J. Schmidt. (2006). Aspen and deer trends on the Chequamegon-Nicolet National Forest. Rhinelander, WI.: Chequamegon-Nicolet National Forest.
Rolley R. E. 2010. White-tailed Deer Population Status 2010. Madison, WI: Wisconsin Department of Natural Resources.
Rooney etal. 2004. Biotic Impoverishment and Homogenization in Unfragmented Forest Understory Communities. UW-Madison. Madison, WI.
Rutherford, A.C.; Schmitz, O.J. 2010. Regional-scale Assement of Deer Impacts on Vegetation Within Western Connecticut, USA. Journal of Wildlife Mgt. 74. BioOne.
Robbins, S. (1991). Wisconsin birdlife: Population and distribution - past and present. Madison, WI: The University of Wisconsin Press.
Salafsky, et al. 2008. Reproductive Responses of Northern Goshawk to Variable Prey Populations. The Journal of Wildlife Mgt. 71.
USDA Forest Service. 2012. Chequamegon-Nicolet National Forest Land and Resource Management Plan - Monitoring and Midterm Evaluation Report : 2009-2010. Rhinelander - Park Falls, WI: Chequamegon-Nicolet National Forest.

WDNR. 2000. Deer Mgt. for 2000 and Beyond Summary of Recommendations. WDNR.
WDNR. 2009. Natural Resources Board Meeting Notes. Retrieved 2011, from Deer management Unit Boundary and Goal Review on Board Order WM-16-09.: http://dnr.wi.gov/or
WDNR. 2011. The Northeast Sands Wisconsin Land Legacy Report. Retrieved 2011, from Ecological Landscapes of Wisconsin: http://dnr.wi.gov/topic/landscapes/

NNIS

WDNR. Invasive Species: Plants; [modified 2008]. Available from: http://dnr.wi.gov/invasives/plants.asp

MA8's

Guyette, R.; Stambaugh, M.; Marschall, J.; Dey, D. A summary of fire history along the Airport Road, Chequamegon-Nicolet National Forest, northeast Wisconsin.; 2010. p. 5.

Soils

Alban, D.H.; Perala, D.A.; Schlaegel, B.E. 1978. Biomass and nutrient distribution in aspen, pine, and spruce stands on the same soil type in Minnesota. Can. J. For. Res. 8(3): 290-299.
Alban, D.H.; Perala, D.A. 1990. Impact of aspen timber harvesting on soils. In: Gessel, S.P.; Lacate, D.S.; Weetman, G.F.; Powers, R.F. eds. Sustained productivity of forest soils: 7th North American forest soils conference; 1988 July 24-28, p. 377-391; Vancover, BC. University of British Columbia.
Dissmeyer, G.E; Foster, G.R. 1980. A Guide for Predicting Sheet and Rill Erosion on Forest Land. USDA Forest Service. Technical Publication SA-TP 11
Federer, C.A.; Hornbeck, J.W.; Tritton, L.M.; Martin, C.W.; Pierce, R.S.;Smith, C.T. 1989. Long-term depletion of calcium and other nutrients in eastern US forests. Environment Management 13(5), p. 593-601.
Grigal, D.A. 2000. Effects of extensive forest management on soil productivity. For. Ecol. & Mgmt. 128, p. 167-185.
Grigal, D.F. 2004. An update of Forest Soils. A technical paper for a generic environmental impact statement on timber harvesting and forest management in Minnesota. David F. Grigal Forestry/Soils Consulting, Roseville, MN 55113.
Grossman, E. B.; Mladenoff, D. J. 2008. Farms, fires, and forestry: Disturbance legacies in the soils of the Northwest Wisconsin (USA) Sand Plain. Forest Ecology and Management. Elsevier.
Herrick, S.K., J.A. Kovach, E.A. Padley, C.R. Wagner, and D.E. Zastrow. 2009. Wisconsin's Forestland Woody Biomass Harvesting Guidelines. Pub-FR-435-2009. WI DNR
National Council for Air and Stream Improvement, Inc. (NCASI). 2004. Effects of heavy equipment on physical properties of soils and on long-term productivity: A review of literature and current research. Technical Bulletin No. 887, p. 38, 76. Research Triangle Park, N.C.
Patric, J.H. 1976. Soil erosion in the eastern forest. J. of Forestry. 74 (10):571-577.
Perala, D.A.; Alban, D.H. 1982. Biomass, nutrient distribution and litterfall in Populus, Pinus and Picea stands on two different soils in Minnesota. Plant and Soil 64(2), p.177-192.

Pritchett, W.L.; Fisher, R.F. 1987. Properties and Management of Forest Soils, p. 77, 190, and 494. John Wiley and Sons. New York.

Powers, R.W. et al. 2005. The North American long-term soil productivity experiment: Findings from the first decade of research. Forest Ecology and Management. Elservier.

Silkworth, D.R.; Grigal, D.F. 1982. Determining and evaluating nutrient losses following whole-tree harvesting of aspen. Soil Sci. Soc. Am. J. 46:626-631

Stone, D.M.; Elioff, J.D. 1998. Soil Properties and aspen development five years after compaction and forest floor removal. USDA Forest Service. Grand Rapids, MN.

USDA Forest Service. 2000c. Timber Sale Activity Review - Soil Impacts Evaluation for the Lakewood-Laona Ranger District, p. 3. Lakewood, WI.

USDA Forest Service. 2001c. Elevation Sale soil resource impact monitoring. Lakewood-Laona Ranger District, p. 2. USDA Forest Service, Lakewood, WI.

USDA Forest Service. 2003a. Timber Sale Activity Review - Soil Impacts Evaluation for the Lakewood-Laona Ranger District, p. 4. Lakewood, WI.

USDA Forest Service. 2005a. Timber Sale Activity Review - Soil Impacts Evaluation for the Lakewood-Laona Ranger District, p. 4. Lakewood, WI.

USDA Forest Service. 2005c. Soil Quality Monitoring. In: Soil Management Handbook, R9 Supplement FSH R9RO 2509.18-2005-1, p. 17. USDA Forest Service, Milwaukee, WI.

USDA Forest Service. 2005d. Soils and Water Conservation Handbook, R9 Draft Supplement, FSH 2509.22-2005-1, p. 108. USDA Forest Service, Milwaukee, WI.

USDA Forest Service. 2006a. Soil Impacts Monitoring on the Lakewood-Laona Ranger District, p 19. Lakewood, WI.

USDA Forest Service. 2010a. Soil Impacts Monitoring on the Lakewood-Laona Ranger District, p 13. Lakewood, WI.

USDA Forest Service. 2010d. Timber Sale Activity Review Report for the Lakewood-Laona Ranger District, p.11. Washburn, WI.

Verry, E.S., 1972. Effect of an aspen clearcutting on water yield and quality in northern Minnesota. In: Watersheds in Transition Symp. Proc. Am. Water Resource Assoc. p. 276-284. Urbana, Ill.

Transportation

USDA Forest Service. Annual. Motorized Visitor Use Map, Published by MJVC, Arnold, MO.

Water Resources

Herrick, S.K., J.A. Kovach, E.A. Padley, C.R. Wagner, and D.E. Zastrow. 2009. Wisconsin's Forestland Woody Biomass Harvesting Guidelines. PUB-FR-435-2009, p. 51. WDNR Division of Forestry and Wisconsin Council on Forestry. Madison, WI.

Shy, K. and C. Wagner, 2007. Wisconsin's Forestry Best Management Practices (BMPs) for Water Quality, 2006 BMP Monitoring Report. Wisconsin Department of Natural Resources, Division of Forestry, PUB-FR-391-2007, p. 35. Madison, Wisconsin.

Spangberg, N. E. and R. McLennan, 1983. Effects of Silvicultural Practices on Water Quality in Northern Wisconsin. Technical Completion Report, Project Number A-095-WIS, p. 17. University of Wisconsin, Water Resources Center, 1975 Willow Drive, Madison, WI.

US Forest Service, 2002. Issue Based Aquatic Assessment for Chequamegon-Nicolet NF. Plan Revision Report.
US Forest Service, 1990. US Forest Service Manual 2530. US Government Printing Office. Washington D.C.
US Forest Service, 2004. US Forest Service Manual 2520. US Government Printing Office. Washington D.C.
Verry, E. S., 1972. Effect of aspen clearcutting on Water Yield and Quality in Northern Minnesota. In:Watersheds in Transition Symposium Proceedings, p. 276-284. American Water Resources Association, Urbanna, Ill.
Verry, E. S., 2000. Water Flow in Soils and Streams: Sustaining Hydrologic Function. In: Riparian Management in Forests of the Continental Eastern United States, p. 99-124; E. S. Verry, J. W. Hornbeck and C. A. Doloff, Editors; CRC Press LLC; Boca Raton, FL.
Verry, E.S., J. R. Lewis and K. N. Brooks, 1983. Aspen Clearcutting Increases Snowmelt and Storm Flow in North Central Minnesota. Water Resources Bulletin 19(1), p. 59-67.
Waters, T. F., 1995. Sediment in Streams: Sources, Biological Effects, and Control. Monograph 7.

GLOSSARY

Affected environment- This is the natural environment that exists at the present time in an area being analyzed.
Age class- This is an age grouping of trees according to an interval of years, usually 20 years. A single age class would have trees that are within 20 years of the same age, such as 1-20 years or 21-40 years.
Basal area- The area of the cross section of a tree trunk near its base, usually 4 and 1/2 feet above the ground. Basal area is a way to measure how much of a site is occupied by trees. The term basal area is often used to describe the collective basal area of trees per acre.
Buffer- This is a land area that is designated to block or absorb unwanted impacts to the area beyond the buffer. Buffer strips along a trail could block views that may be undesirable. Buffers may be set aside next to wildlife habitat to reduce abrupt change to the habitat.
Canopy- A canopy is the part of any stand of trees represented by the tree crowns. It usually refers to the uppermost layer of foliage, but it can be used to describe lower layers in a multi-storied forest.
Clearcut- A harvest in which all or almost all of the trees are removed in one cutting.
Climax- This is the culminating stage in plant succession for a given site. Climax vegetation is stable, self-maintaining, and self-reproducing.
Collector roads- These roads serve small land areas and are usually connected to a Forest System Road, a county road, or a state highway.
Conifer- A conifer is a tree that produces cones, such as a pine, spruce, or fir tree.
Cover type (forest cover type)- Stands of a particular vegetation type that are composed of similar species. The aspen cover type contains plants distinct from the jack pine cover type.
Cumulative effects - Effects on the environment that result from separate, individual actions that, collectively, become significant over time.
DFC – see desired future condition.
DEIS (Draft Environmental Impact Statement)- The draft version of the Environmental Impact Statement that is released to the public and other agencies for review and comment

Desired future condition- Land or resource conditions that are expected to result if goals and objectives are fully achieved.
Disturbance- This is any event, such as wind, forest fire, herbivory, or insect infestations that alter the structure, composition, or functions of an ecosystem.
Endangered species- This is a plant or animal that is in danger of extinction throughout all or a significant portion of its range. Endangered species are identified by the Secretary of the Interior in accordance with the Endangered Species Act of 1973.
Environmental Impact Statement- This is a statement of environmental effects of a proposed action and alternatives to it. The EIS is released to other agencies and the public for comment and review.
Erosion- This is the wearing away of the land surface by wind or water.
Even-aged management- Even-aged management is the timber management actions that result in the creation of stands of trees in which the trees are essentially the same age.
Forest cover type- See cover type.
Forest plan - this document guides the management of a particular National Forest and establishes management standards and guidelines for all lands of that National Forest.
Forest Roads and Trails- Roads and trails under the jurisdiction of the Forest Service.
GIS (geographic information systems)- GIS is both a database designed to handle geographic data as well as a set of computer operations that can be used to analyze the data. In a sense, GIS can be thought of as a higher order map.
Habitat- Habitat is the area where a plant or animal lives and grows under natural conditions.
Habitat type- This is a way to classify land area. A habitat type can support certain climax vegetation, both tree and undergrowth species. Habitat typing can indicate the biological potential of a site.
Individual tree selection- This is the removal of individual trees from certain size and age classes over an entire stand area. Regeneration is mainly natural, and an uneven aged stand is maintained.
Interdisciplinary team- A team of individuals with skills from different disciplines that focuses on the same task or project.
Landing- Any place where cut timber is assembled for further transport from the timber sale area.
Landscape- A large land area composed of interacting ecosystems that are repeated due to factors such as geology, soils, climate, and human impacts. Landscapes are often used for coarse grain analysis.
MA (management area)- an area of National Forest that has a specific management direction given in that forest plan.
Management action- This is any activity undertaken as part of the administration of the National Forest.
MBF- Thousand Board Feet (See board feet.)
Natural resource- A feature of the natural environment that is of value in serving human needs.
NEPA (National Environmental Policy Act) - Congress passed NEPA in 1969 to encourage productive and enjoyable harmony between people and their environment. One of the major tenets of NEPA is its emphasis on public disclosure of possible environmental effects of any major action on public lands. Section 102 of NEPA requires a statement of possible environmental effects to be released to the public and other agencies for review and comment.

NNIS (Non-Native Invasive Species) Plant species that are not native to the natural communities of the project area and are so aggressively invasive, that they pose a threat of harm to those natural communities and existing native species

No action alternative- The most likely condition expected to exist in the future if management practices continue unchanged.

Overstory- The upper canopy layer; the plants below comprise the understory.

Overstory removal- This is the removal of the remaining overstory trees to release desirable understory crop trees.

Present net value (PNV), also called present net worth- The measure of the economic value of a project when costs and revenues occur in different time periods. Future revenues and costs are "discounted" to the present by an interest rate that reflects the changing value of a dollar over time. The assumption is that dollars today are more valuable than dollars in the future. PNV is used to compare project alternatives that have different cost and revenue flows.

Public involvement- The use of appropriate procedures to inform the public, obtain early and continuing public participation, and consider the views of interested parties in planning and decision making.

Ranger District- A ranger district is an administrative sub-unit of a National Forest that is supervised by a District Ranger who reports directly to the Forest Supervisor.

Reforestation- This is the restocking of an area with forest trees, by either natural or artificial means, such as planting.

Regeneration- This is the renewal of a tree crop by either natural or artificial means. The term is also used to refer to the young crop itself.

Responsible official- The Forest Service employee who has been delegated the authority to carry out a specific planning action.

Road- A motor vehicle travelway over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified, or temporary (36 CFR 212.1).

Road construction - This activity results in the addition of forest classified or temporary road miles (36 CFR 212.1).

Road decommissioning - Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1), (FSM 7703).

Road maintenance – This is the ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective (FSM 7712.3).

Road reconstruction- This activity results in improvement or realignment of an existing classified road.

Road improvemen- Activity that results in an increase of an existing road's traffic service level, expands its capacity, or changes its original design function.

Rotation- The number of years required to establish and grow timber crops to a specified condition of maturity.

Sapling- This is a loose term for a young tree more than a few feet tall and an inch or so in diameter that is typically growing vigorously.

Scale- In ecosystem management, it refers to the degree of resolution at which ecosystems are observed and measured.

Scoping- The ongoing process to determine public opinion, receive comments and suggestions, and determine issues during the environmental analysis process. It may involve public meetings, telephone conversations, or letters.

Selection harvest- See individual tree selection.

Sensitive species- This is a plant or animal species, which are susceptible to habitat changes or impacts from activities. The official designation is made by the Forest Service at the Regional level and is not part of the designation of Threatened or Endangered Species made by the US Fish and Wildlife Service.
Serotinous cones- Cones that contain seeds that are released due to heat from a fire
Shelterwood- A cutting method used in a more or less mature stand, designed to establish a new crop under the protection of the old.
Silviculture- This is the art and science that promotes the growth of single trees and the forest as a biological unit.
Site preparation- This is a general term for removing unwanted vegetation, slash, roots, and stones from a site before reforestation. Naturally occurring wildfire, as well as prescribed fire can prepare a site for natural regeneration.
Size class- One of the three intervals of tree stem diameters used to classify timber in the forest plan database. The size classes are: Seedling/Sapling (less than 5 inches in diameter); Pole Timber (5 to 7 inches in diameter); Sawtimber (greater than 7 inches in diameter)
Skidding- Hauling logs by sliding, not on wheels, from stump to a collection point.
Slash (logging residue)- The residue left on the ground after timber cutting or left after a storm, fire, or other event. Slash includes unused logs, uprooted stumps, broken or uprooted stems, branches, bark, etc.
Snag- A snag is a standing dead tree. Snags are important as habitat for a variety of wildlife species and their prey.
Soil compaction- Increased soil density (weight per unit volume) and strength that hampers root growth, reduces soil aeration and inhibits soil water movement.
Soil productivity- Increased soil density (weight per unit volume) and strength that hampers root growth, reduces soil aeration and inhibits soil water movement.
Special Cut- This harvest treatment is so-named because it really doesn't fit into any other traditional harvest categories. This harvest method is not intended to be a regeneration harvest, such as the clearcut or shelterwood method. However, it would greatly reduce the density of the target stand – from a closed forest stand to a variably open, grassy condition that still qualifies as a sparsely-stocked forested type. Responding to the Lakewood Southeast Project's Purpose and Need – and with an eye on historical reference conditions – the special cut would vary widely in implementation. In some areas, adjacent to existing grassy openings, nearly all the trees would be removed. In other areas that are currently more dense, the resulting stand would resemble a shelterwood seed cut. The areas treated by special cuts would constitute a mosaic of varying densities that would be much more in line with historical conditions. Areas receiving special cuts would also be treated extensively with prescribed fire in an attempt to emulate historic ecological processes.
Stand- A stand is a group of trees that occupies a specific area and is similar in species, age, and condition.
Standards and guidelines- Requirements found in a forest plan which impose limits on natural resource management activities, generally for environmental protection.
Stocking level- This is the number of tree in an area as compared to the desirable number of trees for best results, such as maximum wood production.
structure- How the parts of ecosystems are arranged, both horizontally and vertically. Structure might reveal a pattern, or mosaic, or total randomness of vegetation.
System Road- Road designated by the Forest Service for long-term motorized access.

Thinning- A cutting made in an immature stand of trees to accelerate growth of the remaining trees or to improve the form of the remaining trees.
Traffic service level- This describes the significant characteristics and operating conditions of a road (FSH 7709.56, ch.4).
TSI (Timber Stand Improvement)- Actions to improve growing conditions for trees in a stand, such as thinning, pruning, prescribed fire, or release cutting.
Type conversion- The conversion of the dominant vegetation in an area from forested to non-forested or from one species to another.
Unclassified roads- Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1).
Understory- The trees and woody shrubs growing beneath the overstory in a stand of trees.
Uneven-aged management - Actions that maintain a forest or stand of trees composed of intermingling trees that differ markedly in age. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.
Vegetation management- Activities designed primarily to promote the health of forest vegetation for multiple-use purposes.

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Appendices

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Appendix B – Proposed Road Actions
Appendix C – Maps
Appendix D – Forest Plan Standards and Guidelines
Appendix E- Comments and Responses